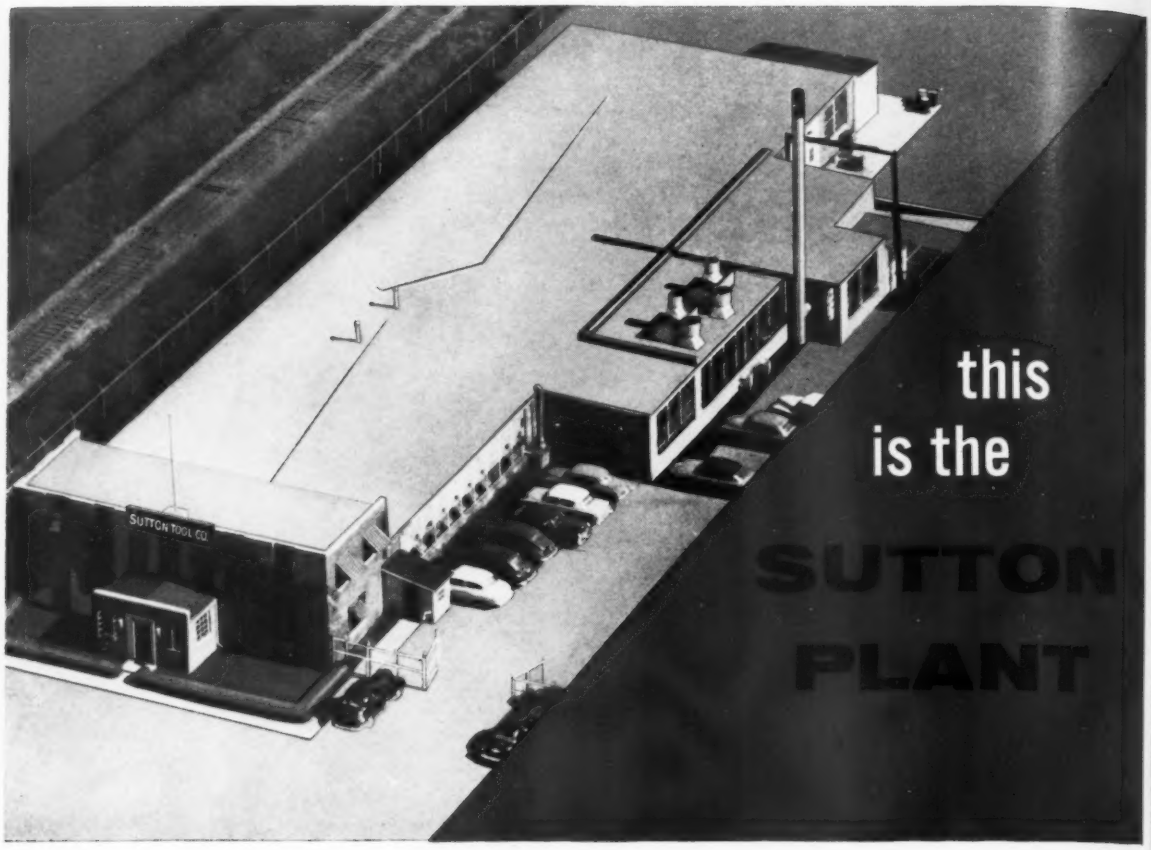
TOOLING & PRODUCTION

Magazine of Metal Working Methods

MARCH 1961

Emphasis . . . DRILLING!



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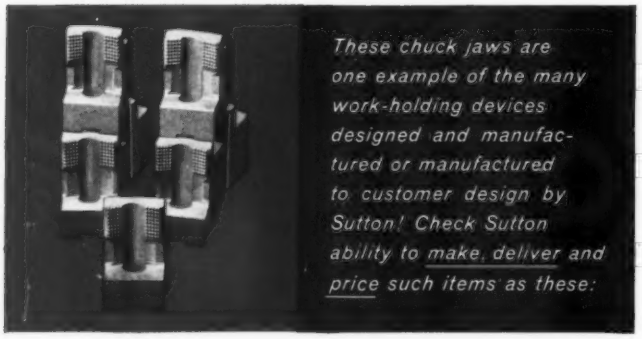

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CIRCLE INFORM-A-GRAM KEY NO. 2

TOOLING & PRODUCTION Magazine

VOL. XXVI, No. 12
MARCH 1961

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TOOLING & PRODUCTION MAGAZINE

Vol. XXVI, No. 12 George J. Huebner, Founder 1885-1956

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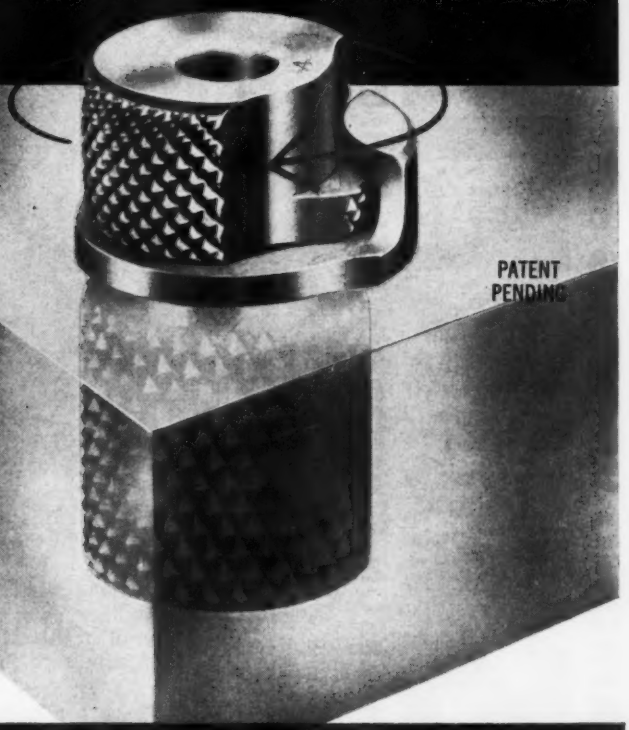

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personally speaking...

Dear T & P Reader:

As you probably guessed the minute you saw the cover of this issue, the emphasis of it is on drilling and, of course, tapping, which goes with drilling like cheese with apple pie. These two machining operations are the commonest of all and there probably is, therefore, the most known about them. But, there are new disclosures that come to our attention from time to time and you'll find some in this issue.

For example, you won't want to miss "Tips on Drill Pointing" because this article comes from one of our foremost drill manufacturers, the Cleveland Twist Drill Company. I'm sure it will have some ideas for you.

Also, there is a case history article entitled "Drilling and Tapping Up 400%." This was accomplished on a Burgmaster machine, cleverly tooled.

Another outstanding drilling article is a case history of the accomplishments of a tape-controlled turret drill at the Harris-Seybold Company here in Cleveland.

There are a number of other features on drilling in the issue, which you will want to consider, and then, there is also another article in the Baxter Fullerton series on machine replacement, which we are very pleased to bring to you.

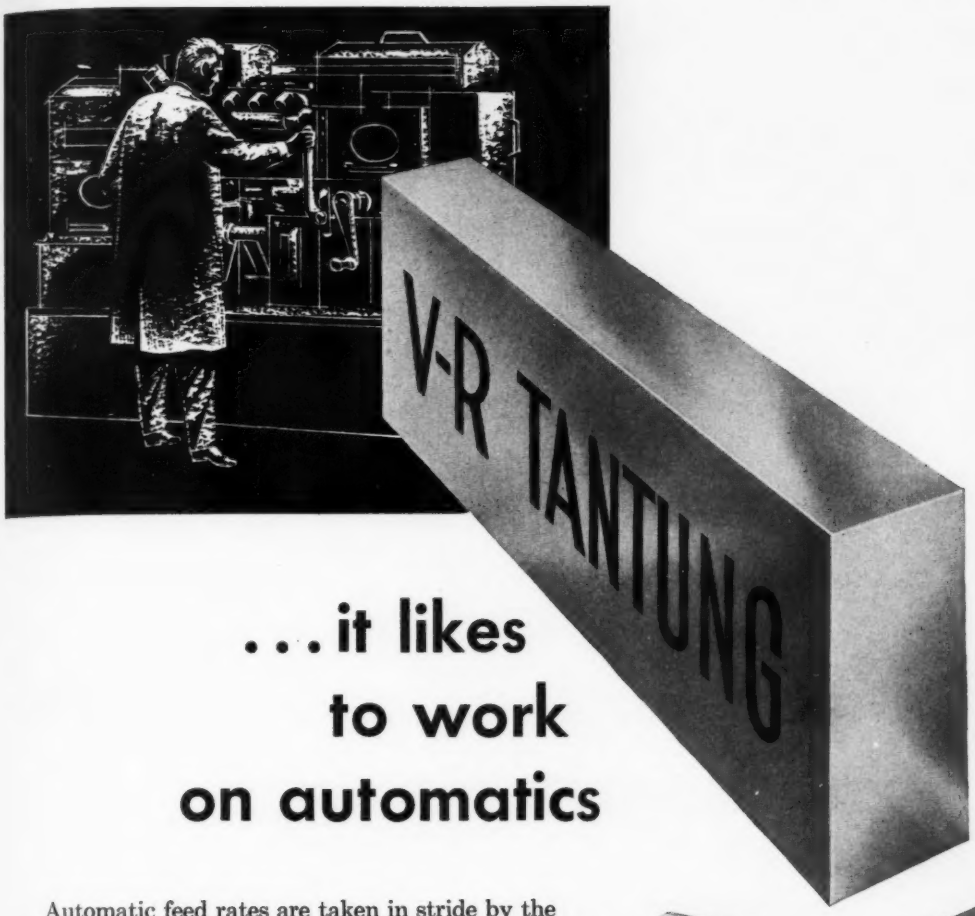
A few issues ago, I made some remarks to you about Echo I, our very noteworthy balloon satellite which was placed in orbit during the summer of 1960 for use for communications. Soon after I mentioned it in this column, its constantly changing course took it out of view of us here in the United States, although it is still in orbit and sometime will again be visible to us. My reason for mentioning this in the first place was that I was so impressed with it as being a manifestation of the space age that could be appreciated by every American.

The accomplishment of fabricating and then placing Echo I in orbit is a fascinating story, as you, I'm sure, will agree if you have read the account of it in the February issue of Reader's Digest. If you haven't seen it, I recommend that you make a point of getting hold of a copy of that issue and reading that article. I'm sure you will be as impressed as I am.

Cordially yours,

Ray Hackner

Publisher



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Talk of the Month

Small Lot and Production Engineering Problems

by H. M. Wilson

This article was excerpted from a talk by Mr. Wilson, vice president for manufacturing of General Radio Co., West Concord, Mass. to a group of professional engineers at their Fourth Annual Conference during the Northeast Electronics Research and Engineering Meeting in Boston.

PRODUCTION MANAGEMENT is devoted to organizational and humanitarian problems, but these are not peculiar to manufacturing.

The problem that belongs to manufacturing alone is that of producing a satisfactory product at a satisfactory price — the perpetual compromise between cost and quality. For any specific company, the quality bracket is generally fixed. Its products may be aimed at Cadillac customers or Woolworth customers, but the quality it must meet, and the price it can charge, are prescribed by a competitive market. The only variable is internal cost.

This is the production problem that causes us to attend seminars on material handling, work simplification, standardization, methods study, and kindred subjects. It is an eternal search for ways to gain efficiency, cut costs and make business more profitable.

Traditionally, the factory costs of a product are based on direct material consumed, and direct labor expended in increasing its value. Accounting people still use these direct costs, along with overhead, as a base from which relative total costs are determined. However, this base is dwindling in proportion to total costs every year, and a better foundation will have to be developed soon or we will not be able to think clearly about our cost problems.

Other Areas Than Labor

In some hypothetical, fully automated plant of the future, with

. . . Continued on page 8

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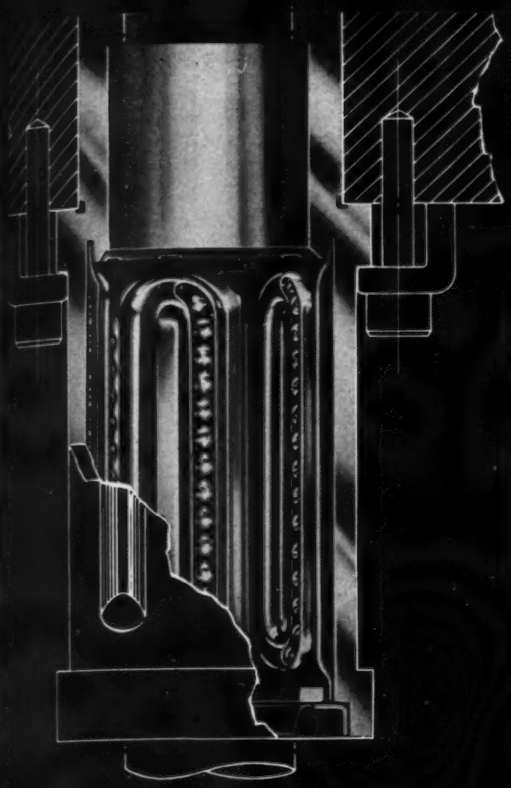

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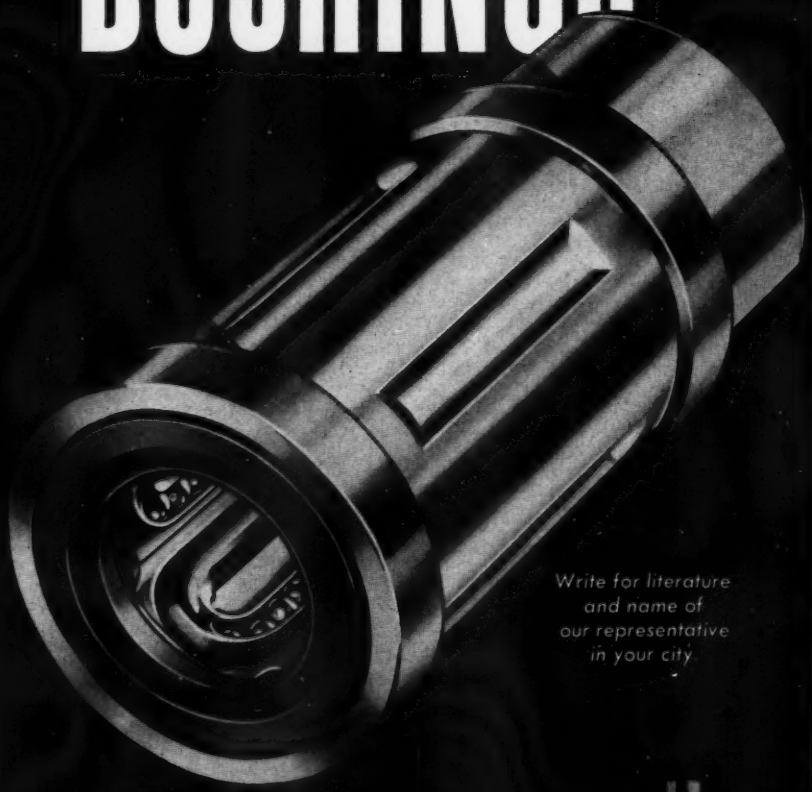

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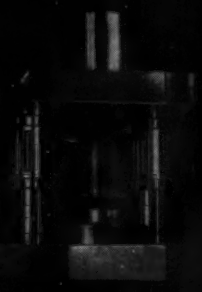

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. . . Month's Talk from page 6

several hundred supporting employees and only one shop man to push the buttons, studying ways to cut direct labor would be ridiculous. If a methods group succeeded in cutting this one man's time in half, they would only double the overhead multiplier and would not change the cost of the product.

This extreme case may sound silly, but look at your own operations from a distance. You will probably find that you are nearer to this condition than you realize.

Material has to be marked up for purchasing costs, shipping charges, receiving, inspection, handling, storing, record keeping and disbursing. Labor has to be burdened with comfortable work space, supervision, power, communication, more inspection and sophisticated tools.

Our company is typical of a manufacturing concern making technical products. Payroll is about half the cost of doing business, but only about half of the payroll goes to the manufacturing department. About two-fifths of the manufacturing payroll goes for direct shop labor. The result is that less than 10% of our whole product cost is for direct productive work. One and a half times as much is spent for the non-productive payroll in manufacturing alone, exclusive of corporate administration, sales or engineering.

Most companies in electronic production are paying employees more dollars in their production departments for planning, scheduling, ordering, routing, stock handling, expediting, inspecting and supervising than they are for so-called productive labor. In contrast, years ago, factory overhead was a fractional markup on labor.

The danger when we undertake a cost reduction program on a product is that we can delude ourselves. If we think that by concentrating on the small percentage of cost which represents direct labor, we are going to get rid of several times as many overhead dollars, we are wrong. In fact, by working on this problem from the wrong perspective, it is easy to increase overhead costs faster than you can decrease the direct labor costs. The only true measure of profitability is the difference between what your company takes in and what it spends.

Streamline Supporting Functions

What can we do about this? One thing I do as the officer responsible for all of manufacturing operations is to devote more time to improving the efficiency of the supporting functions than I do the fabrication processes. I can save the company more dollars in these areas.

We talk of the problems of small-lot production and we think immediately of factors like excessive setup costs caused by short runs, the difficulty of getting economical loading on specialized machine tools, the high prices paid for small-quantity purchases and repetitious ordering.

I do not underestimate the effects of these problems, but the point that must be underscored is

. . . Continued on page 12

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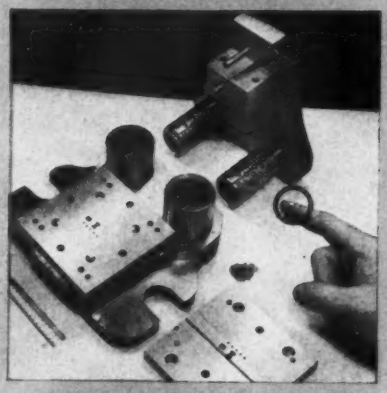
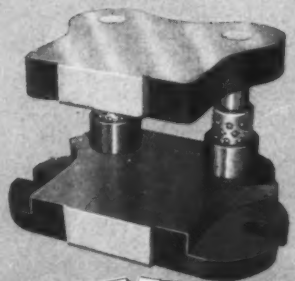
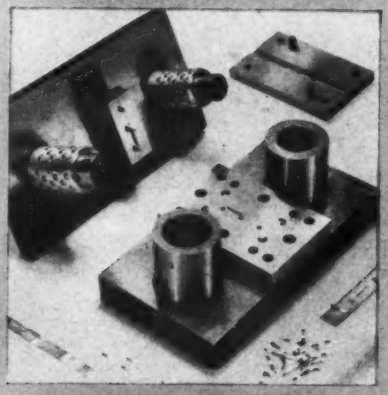


MATERIAL: .001" Thick, High Nickel Alloy
Punched Holes, .001" Diameter





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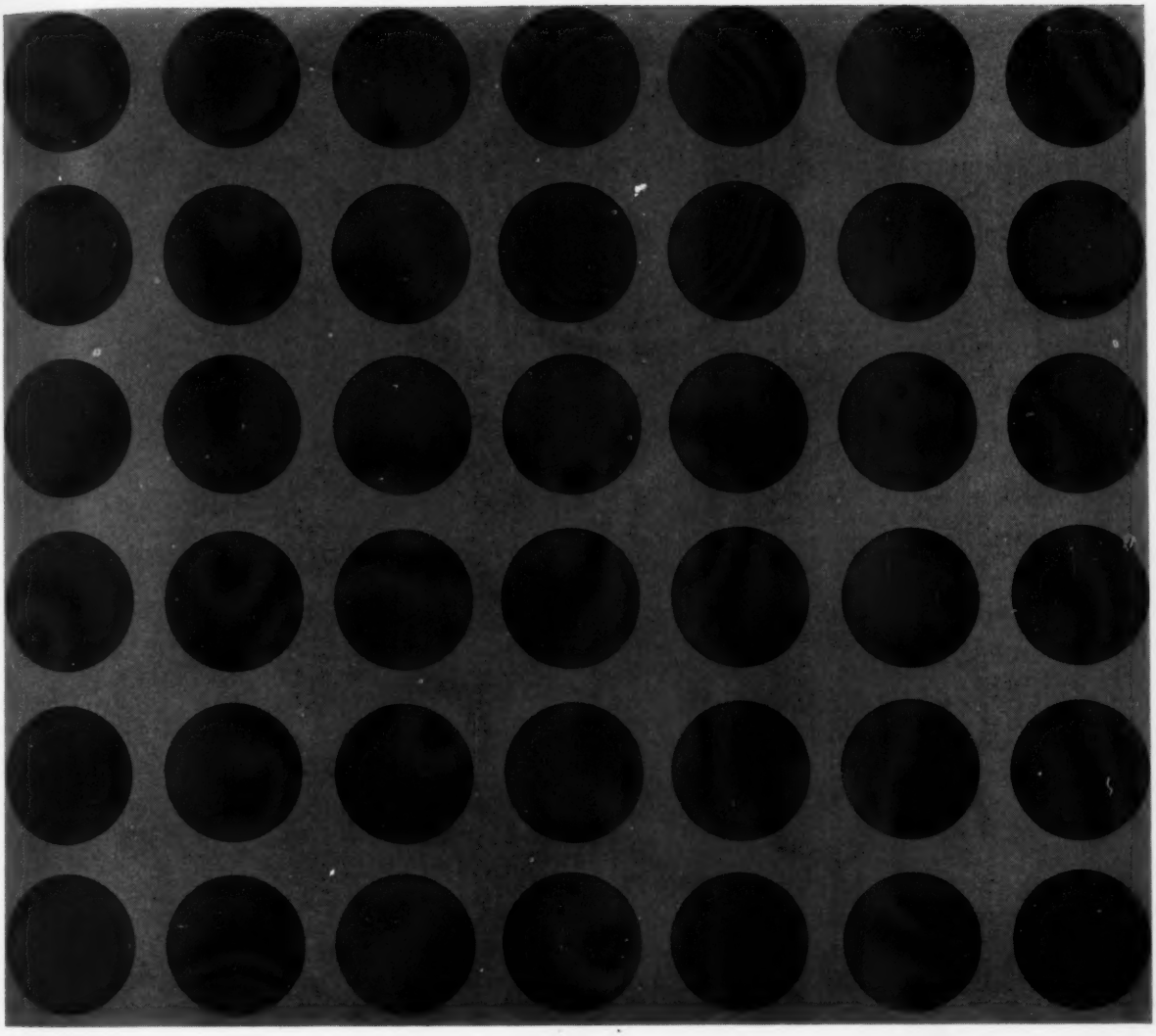

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Travel, spindle ..... 30 millionths in 2¼"

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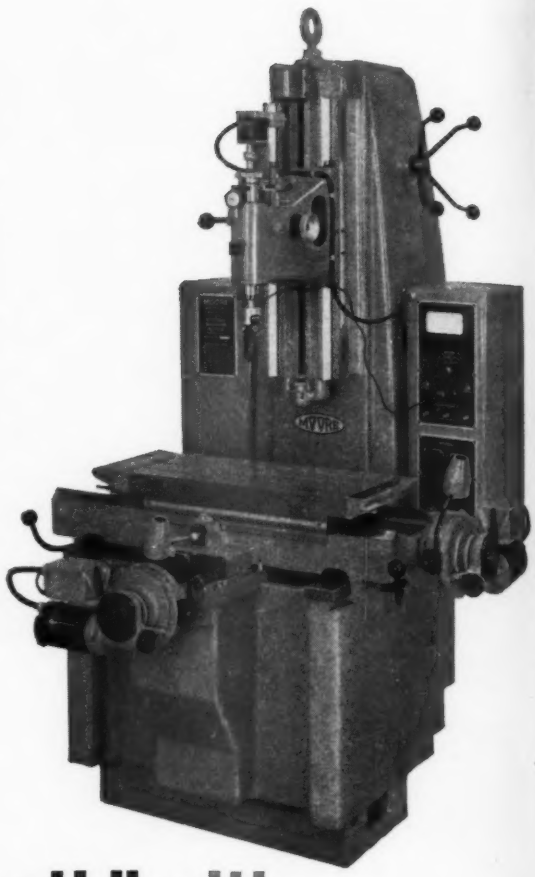

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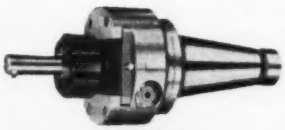
OTHER PRECISION-BUILT COST-SAVING UNIVERSAL PRODUCTION TOOLS

211

Floating Chuck

Standard Collet Chuck

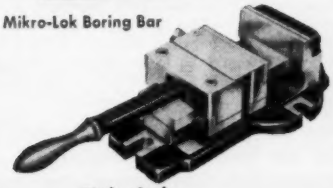
Mikro-Lok Boring Bar



Boring Chuck

"Kwik-Switch" Tool Holder

Standard Drill Bushing



Wedge-Lock Production Vise

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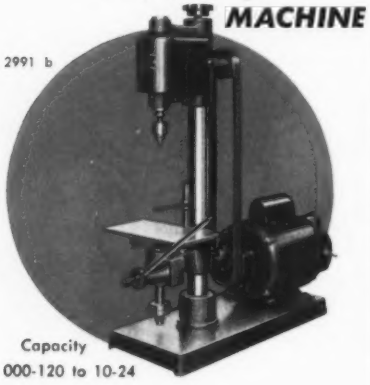
Tapping
MACHINE



Spindle does not rotate between duty cycles but starts cutting rotation softly and slowly as pressure is applied to the feed lever. Further, rotation stops instantly and automatically when pressure on the feed lever is released; and reverses when pressure is reversed.

As a result of this unique feature, blind holes now can be tapped to the very bottom without risk of tap breakage, thin materials can be precision tapped without stripping, brittle materials can be tapped without chipping.

YOUR JOBS can be tapped better, faster, and with more precision on a HAMILTON machine.

In requesting COMPLETE INFORMATION ask for free Bulletin No. 2991.

THE HAMILTON

A super sensitive, small hole, precision drilling machine which offers infinitely variable speeds in two ranges between 840 and 9300 R.P.M. A true "companion" to the HAMILTON Super Sensitive Tapping MACHINE. Capacity — .004" to 5/16" in all drillable materials.

For complete information ask us for our free Bulletin No. V/14.

THE HAMILTON TOOL COMPANY

832 SOUTH NINTH STREET
HAMILTON, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 12

. . . Month's Talk from page 8

that as technology advances, control costs, supporting jobs and paperwork become the areas to watch.

We make 400 catalog items in job lots from 25 to more than 2500. Internal orders are received from our sales department for these lots with an average frequency of two orders per-year per-item. It requires about 18,000 different parts in our stockroom to produce the 400 assortment, but thanks to design engineering, we use only 18,000 parts and not 28,000. We were headed in that direction before we standardized.

How It's Done

To cut costs in controlling the flow of parts and instruments, we introduced the IBM punched card system. With it we questioned every piece of paper and office procedure, to cull out the unnecessary.

We have set up a punched-card master bill-of-material for each instrument we make and keep them up-to-date as to engineering changes. Assimilating changes into manufacturing, requires the full time of two office girls. This is an expense every production man would like to throttle in the beginning but better judgement tells him obsolescence would set in without it.

Upon receipt of a batch of internal orders, master decks called for are run with order-quantity multipliers to produce material requirement decks. These requirement decks then determine stock availability from inventory records and are used to initiate orders for items not found. These become shortage documents in the plant control file, and eventually serve as stock-issue tickets when the job is ready for assembly. We call this particular system a "card-loop" because each card makes a complete circuit, serving several functions en route.

Material-requirement cards instigate punched-card job tickets for each operation so that we can machine-compile our shop payroll, which is based on piecework. Machine reproductions of these tickets serve as operation-by-operation status markers in our plant-control file. These markers are continually purged by move tickets as operations are completed.

Other reproductions of these tickets are arranged by work area instead of by job, and give us a continuous scheduled work-load picture of each work station.

We have also created a punched-card master-standard cost file, which is continuously kept up to date for each part so that we can run a master bill-of-material with it, and machine-cost any instrument at any time.

Clerical Costs Cut

One advantage comes when we put all our bills-of-material in part-number sequence so that multiple usage of all parts can be combined into a single usage rate with where-used data. In our traditional consciousness of direct labor costs, we had sometimes spent several times the savings in shop set-up cost by arduous clerical searching of stock records to combine shop orders. Now, readily available information permits us to select large usage parts and put them on inventory control. We have learned to let other orders fall where they may, because avoiding duplicate setups involves more office time than the apparent savings would justify.

Another area where many overhead dollars are spent at cross-purposes is in-plant expediting. We make a strenuous effort to get all work areas on realistic schedules based on numbered weeks. In this way we work to instill schedule consciousness throughout the plant, and stop indiscriminate use of overriding priorities, and thereby reduce expediting to a bare minimum.

Another thought which pays off is to freeze the quantities of internal orders from sales, and only vary their frequency. Repeating quantities saves hours of schedule calculations, and permits doubling quantities when economy dictates.

We have even gone into quality-control to determine absolute minimums for sampling quantities so that we expend the least manhours to attain a given quality level.

In fact, in all control and supporting areas, we have been guided by one philosophy: guide all work

. . . Continued on page 14

2991 a

HAMILTON SUPER SENSITIVE *Tapping* MACHINE

Capacity — 000-120 to 10-24

In the field of small hole, precision tapping the HAMILTON Super Sensitive Tapping MACHINE stands alone. It is smooth, silent, precise, and sturdy.

Spindle returns to neutral position and stops rotation instantly and automatically when pressure on the feed lever is released.

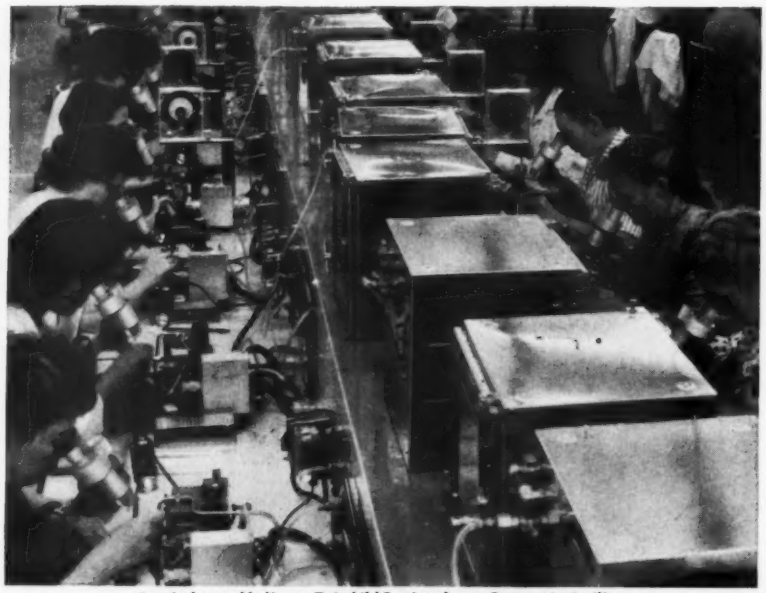
See ad on opposite page to learn what this means to you!

THE HAMILTON TOOL COMPANY

832 SOUTH NINTH STREET HAMILTON, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 13

AO Stereo Microscopes lick unusual assembly problems at Fairchild Semiconductor



A typical assembly line at Fairchild Semiconductor Corporation's silicon transistor plant in Mountain View, California.

Fairchild Semiconductor Corporation, one of the nation's largest manufacturers of semiconductor products and electronic components, needed microscopes, hundreds of them, for the assembly of their extremely small component parts. But they had specific problems to overcome, such as extreme temperature changes, rough handling and operator fatigue. Let their transistor Plant Manager, Mr. Charles Sporck, tell you, in his own words, how these problems were solved.

"The optical and mechanical design of our American Optical microscopes (AO Series 27 Stereo Microscopes) allows our assemblers to work with them for a longer period of time, without the normally prevalent operator fatigue. They stay in collimation better through the rough handling and severe temperature cycling, common to our production. We also like their ease of maintenance which enables us to perform all routine adjustments and repairs in our own plant".

If you are faced with any kind of production, assembly or inspection problem which can be helped by the use of Stereoscopic Microscopes . . . ask to see the most complete line available in America today. From over a hundred different models you'll be sure to find, like Mr. Sporck, one that exactly fills the bill for you. Coupon below brings complete information.

American Optical Company

SPENCER

INSTRUMENT DIVISION, BUFFALO 15, NEW YORK

Dept. Q179

Please send 32 page Color Brochure SB56 on American Optical Stereoscopic Microscopes and accessories.

Name_____

Address_____

City_____ Zone____ State_____

IN CANADA write—American Optical Company Canada Ltd., Box 40, Terminal A., Toronto, Ontario.

CIRCLE INFORM-A-GRAM KEY NO. 14

. . . Month's Talk from page 12

the simplest way into and out of the plant.

The result of these efforts has been that while our output increased by about one-third, and direct labor in proportion, our production office staff has not increased at all, and it is estimated that we save more than $100,000/yr in this area alone.

Exactly What Things Are Coming To

Enormous file systems which "think for themselves" may be the result of research undertaken for the National Science Foundation.

A $68,400 contract for an exploratory study into file organization which will permit great masses of scientific information to be sorted, classified and made available by the file itself, has been awarded to the Advanced Information Systems Co., a subsidiary of The Electrada Corp., Beverly Hills, Calif.

The contract is part of a master plan for improving the dissemination of scientific information in the United States. In 1958 Congress gave the NSF the task of developing new and improved methods for making the world's rapidly growing store of scientific information available to American scientists and engineers. Previous contracts have generally gone to colleges and universities.

A team of advanced scientists, psychologists and engineers have assembled to handle the project, and an investigation is planned into the physiological and psychological aspects of human memory, which represents the most highly developed filing system known. One major area of investigation will be the basic interrelation of information, and the time duration required for its "useful" retrieval and retention.

The Advanced Information Systems Co. will provide consultation upon problems in data dynamics for outside organizations, and as a separate subsidiary, the company will be able to provide unbiased and objective research and systems management for other firms and government agencies.

CLEARING MAKES OPERATIONAL CHECK ON PRESS DESTINED FOR JAPAN

Production efficiency—almost a million pounds of it—is on its way from Clearing's assembly floor to Japan. This giant double action press will head up a press line at the Isuzu Motor Co., Ltd., in Tokyo.

The bottom drive machine above has practically everything—enclosed design, Clearing's dual speed clutch, moving bolsters, hydraulic overload units, die cushions and locks—everything to make it a major contribution to Japan's bustling economy.

Want to make your production bustle? Clearing can supply the answer with the kind of thinking you need—with press equipment best suited for your purposes—mechanical or hydraulic, large or small. Let's talk.

USI Clearing

DIVISION OF U. S. INDUSTRIES, INC.

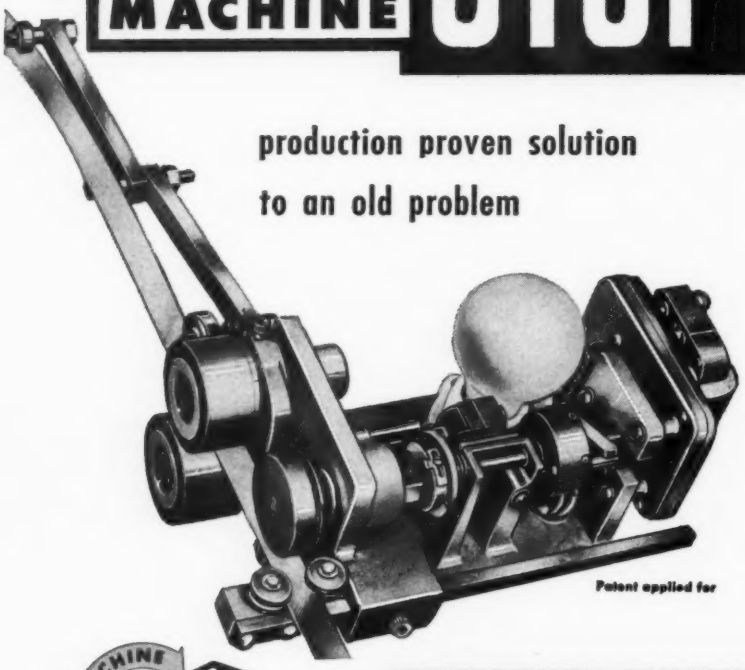
6499 W. 65th Street • Chicago 38, Illinois • Telephone PO 7-8700

See Clearing's booth at A.S.T.M.E. Exposition, New York Coliseum — Booth #3501

CIRCLE INFORM-A-GRAM KEY NO. 15

POSITIVE MECHANICAL ACTION MACHINE STOP

production proven solution to an old problem



Patent applied for

MACHINE FEED-OFF STOP

Feed-Off is inexpensive and versatile, pays for itself immediately, increases die life, saves down time, saves die repair time, helps as a guide for stock entering machine.

Rugged, accurate, dependable Feed-Off has only a few simple adjustments which can be set accurately and quickly in minutes.

STOPS MACHINE when length of stock per stroke drops below a preset minimum

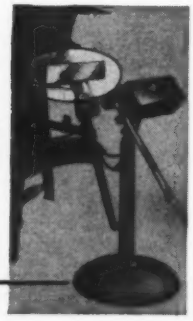
STOPS MACHINE when stock is oversize in thickness

STOPS MACHINE when stock is undersize in thickness

STOPS MACHINE when defects such as burrs and tears occur in stock

STOPS MACHINE when stock coil end approaches

PORTABLE . . . EASY TO INSTALL



Write for complete details

RANDS PRODUCTS, INC.

DEPT. C, WILLIMANTIC, CONN.

CIRCLE INFORM-A-GRAM KEY NO. 16

Idea Generation . . .

Value Programs for Industry, Inc., a professional consulting firm to provide Value Analysis training and consulting services to industry, has been recently organized. It will provide scientific value training, training in idea generation and development, and programs for the rejuvenation of existing cost reduction activities.

The firm was organized and will be directed by R. E. Fountain, president, and John F. Prendergast, vice president-treasurer. Both have been professional value specialists in operating departments of General Electric. Between them they have managed 54 company-wide value analysis seminars training more than 5000 technical and management personnel.

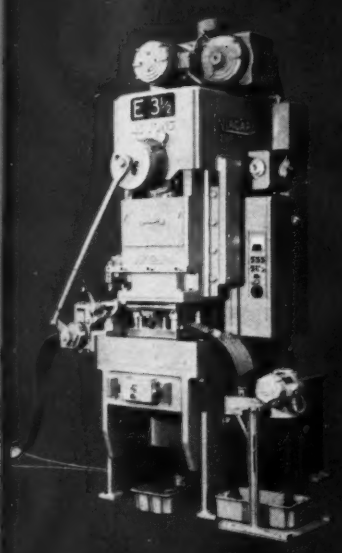
Their office is located at 425 State St., Schenectady, N.Y.

Chipless Machining

Advances in machining processes are providing the metalworking industry with a wider choice of methods to produce a part. Among the most significant developments are the newer chipless processes of cold working steel to make parts that ordinarily would be done by metal cutting processes. The newer methods include rolling of serrations, splines and gears; power spinning, internal swaging, radial forging, cold extrusion and explosive forming. They are discussed in detail from a how-to-do-it standpoint in a recently published book, *Chipless Machining* by Charles H. Wick (The Industrial Press, 93 Worth St., New York 13, N.Y., 1960. 502 pages, $10). The older, more established processes of cold heading, thread rolling and rotary swaging are also covered.

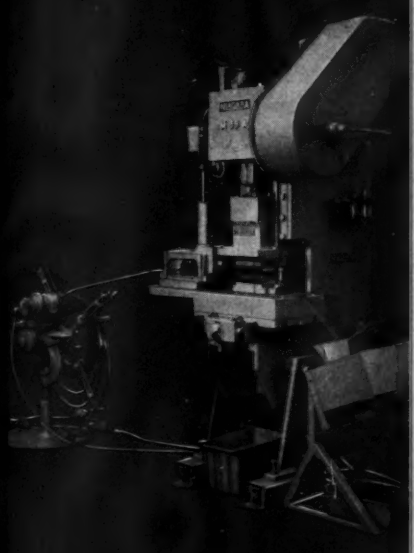
Principles of the chipless processes are explained and equipment, tooling and techniques are described in this well illustrated book. Case histories of successful applications include detailed accounts of the operations employed. The author does a good job of compiling the available information on these processes into a comprehensive guide for users and potential users of chipless methods.

PRECISION PARTS BY THE MILLIONS



RIES E — FRONT-TO-BACK CRANKSHAFT OBI's
Capacities: 45 to 200 tons.
45-ton model (above) stamps out fuse tips at rate of million/day.

SERIES SA-2 STRAIGHTSIDE AUTOMATICS
Capacities: 25 to 300 tons.
100-ton package (above) includes double roll feed, stock reel, scrap cutter.



SERIES M — ULTRA-HIGH SPEED OBI's
Capacities: 22 to 60 tons.
35-ton model shown operates at adjustable speeds up to 1000 spm and produces parts at rate of million/day.

3 great Niagara lines excel in automatic, high speed, progressive die work

Premium construction: It's the key to premium performance here! These modern Niagara presses are designed strictly for automatic, high speed, progressive die work.

Model for model, they'll turn out more parts per hour than conventional presses of equivalent tonnage can even approach. Far heavier and more massive, they have the ruggedness, rigidity, and stamina to run vibration-free at high speeds.

Providing more guiding surface, their gibbing holds slide and bed in precise alignment for precise production, longer periods between die grinds, and longest possible die life.

But this just begins to tell the story . . .

YOU'RE INVITED TO CHECK all the features of these production-boosting machines. Illustrated Bulletins 54 (Series M), 56 (Series E), and 264 (Series SA-2), will be mailed on request. Write: Niagara Machine & Tool Works, Buffalo 11, N.Y.

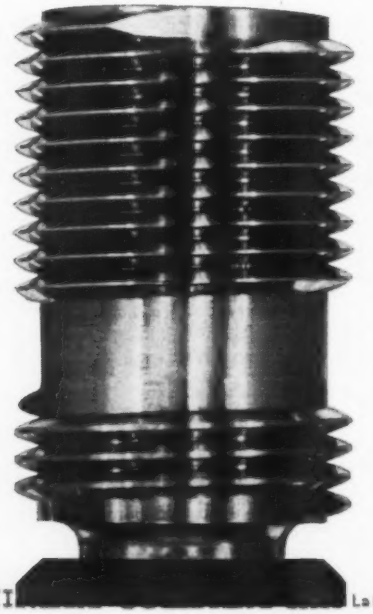
NIAGARA

America's most complete line of presses, press brakes, shears, other machines and tools for plate and sheet metal work.

CIRCLE INFORM-A-GRAM KEY NO. 17

You're Not Dependent
On The Human
Yardstick...

With Pipe Machinery HILO Thread Setting Plug Gages



You no longer need rely on such a vague and indefinite human measuring standard as your individual operators sense of "feel" to determine whether thread ring gages (solid or adjustable) are bell mouthed and out of limits.

Pipe Machinery HILO Set Plugs are designed with two sections having different pitch diameters, but identical lead and angles. If the smaller end of the plug enters and the larger end is held out, the ring is the proper size. There's never any guesswork — never any cause for debate as to what constitutes a snug fit or acceptable shake.

For more complete information on these new, more accurate setting gages, write us on your company letterhead today.

THE PIPE MACHI Lakeland Boulevard • Wickliffe, Ohio • Greater Cleveland

CIRCLE INFORM-A-GRAM KEY NO. 18

LOOKING FOR A FASTER AND MORE ECONOMICAL WAY...

TO FORM COMPLICATED WIRE & RIBBON METAL PARTS

NILSON 4 SLIDES
NILSON FOURSLIDE
DESIGN & TOOLING HANDBOOK
Wire and Ribbon Metal Forming FOURSLIDE Machines
THE A. H. NILSON MACHINE COMPANY
Shelton, Connecticut, U.S.A.

If you are looking, it will pay you to investigate NILSON Fourslide Forming Machines, which can handle wire diameters from 0.010" to 0.5" (feed lengths to 32") and ribbon stock up to 4" wide (feed lengths to 24"). And, parts can be produced at rates over 400 per minute.

NOW—NILSON'S NEW "FOURSLIDE DESIGN AND TOOLING HANDBOOK" is available.

For the first time, a NEW—"FOURSLIDE Design & Tooling Handbook" explains many important aspects of the FOURSLIDE PROCESS. It will help you in product design, in methods engineering, and in tooling. The HANDBOOK describes design aspects of parts formed on a FOURSLIDE; Drawings and descriptions of tooling design using actual examples; How to combine operations, such as stamping and forming, cut-off, forming and welding, or forming and assembly. Many other facts also given.

We invite you to write today for your free NILSON "FOURSLIDE DESIGN & TOOLING HANDBOOK". You will also receive the new NILSON Bulletin No. 62 covering the widest range of FOURSLIDES available—17 models.

NILSON

A. H. Nilson Machine Company

628 Bridgeport Avenue Shelton, Connecticut Telephone: WAverly 9-1433

CIRCLE INFORM-A-GRAM KEY NO. 19

UNIVERSAL JIG AND FIXTURE COMPONENTS AND CLAMP ASSEMBLIES

Shown here are a few of more than a thousand different items in regular steel and stainless steel —the largest and most complete selection in the United States—now available from Universal Engineering Co. Write today for your copy of the complete, new catalog.

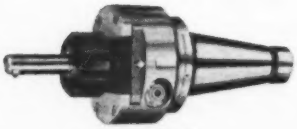
213

OTHER PRECISION-BUILT COST SAVING UNIVERSAL PRODUCTION TOOLS

Floating Chuck

Standard Collet Chuck

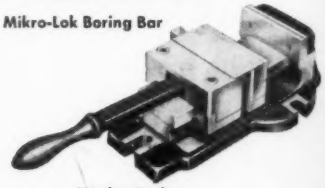
Mikro-Lok Boring Bar



Boring Chuck

"Kwik-Switch" Tool Holder

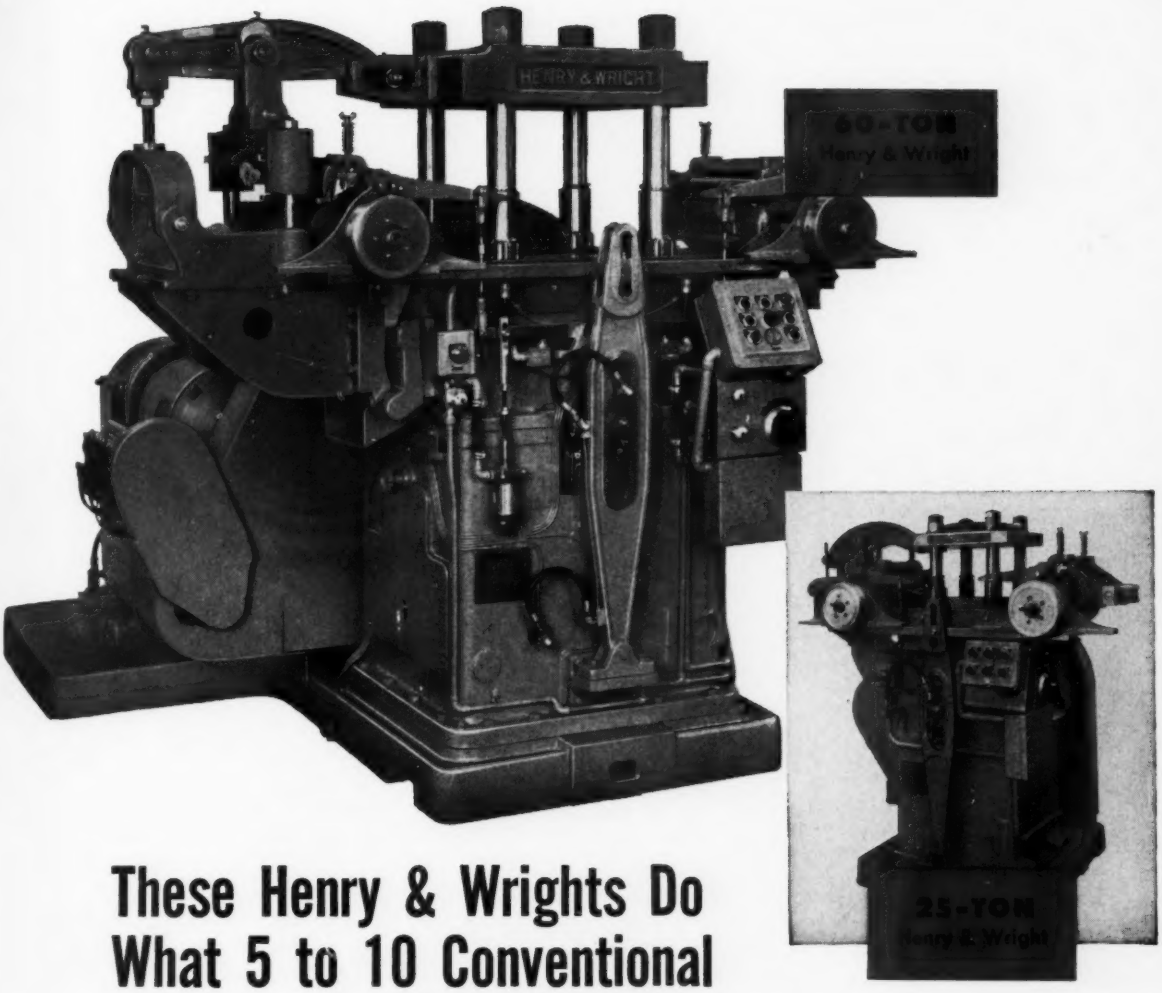
Standard Drill Bushing



Wedge-Lock Production Vise

UNIVERSAL ENGINEERING COMPANY, FRANKENMUTH 8, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 20



These Henry & Wrights Do What 5 to 10 Conventional Presses Do- *More Quickly*

Over 3000 Henry & Wright Dieing Machines in service today, attest to the popularity of one of our earliest forms of automation. They were born to the mass production industry almost before it started. Every model employs the same basic design principles. A low center of gravity with all driving elements below the die bed assures stability for high speed operation. Precision alignment is provided by the long guiding surfaces; a pulling stroke rather than a pushing force gives better control; angular thrust of crankshaft is absorbed by lower crosshead instead of by slide or punch. These and many other features assure maximum die life, at higher speeds, with more profit for you.

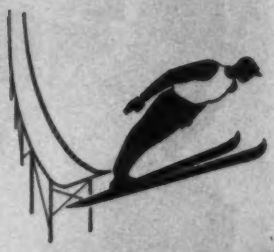
These high production units can replace the work of several conventional presses cutting labor costs proportionately. Modern progressive dies can produce virtually any shape, with any material, simpler and faster. Let H-P-M engineers adapt Henry & Wrights to your next mass production problem. Take advantage of less operating cost, reduced amount of floor space required, greater production output.

H-P-M
DIVISION Koehring Company
Mount Gilead, Ohio, U.S.A.

HPM H40

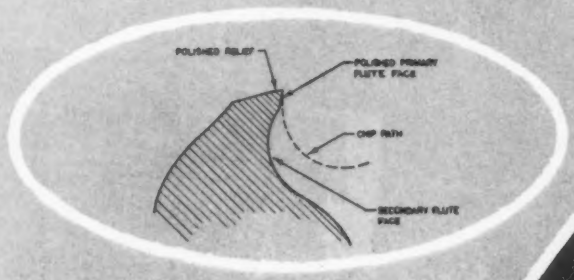
CIRCLE INFORM-A-GRAM KEY NO. 21

WELDON *Ski-Kut* END MILLS



FOR CUTTING ALUMINUM

PATENT APPLIED FOR



CUTTING ALUMINUM MADE EASIER, SMOOTHER AND FASTER

The primary flute face of the Ski-Kut End Mills, being narrow, definitely minimizes adherence of chips to the flute faces. Such adherence or welding of aluminum chips contributes in a major degree to the difficulty in milling aluminum.

Greater feeds, longer tool life, better finish, easier operation of equipment are some of the advantages to be gained by the use of Weldon Ski-Kut End Mills for cutting aluminum.

Weldon SKI-KUT End Mills are available from stock in size from 1/4" to 2" in various lengths. For full information write for folder SKM-1

1. Minimizes adherence of Chips to Flute Faces
2. Increased Shearing Action(45° Helix Angle)
3. Hammering Effect Practically Eliminated
4. Greater Feeds
5. Longer Tool Life
6. Better Finish
7. Easier Operation

A RADICALLY NEW DEVELOPMENT IN END MILL DESIGN FOR CUTTING ALUMINUM THAT SPEEDS PRODUCTION AND REDUCES COST.

Catalog list numbers are now marked on all Weldon tools and holders as an aid when reordering . . . another WELDON FIRST.

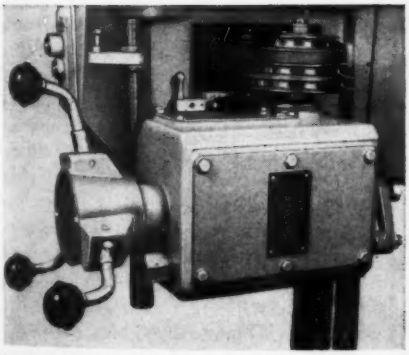
Weldon distributors throughout U. S. A. and Canada carry complete stocks to serve you. SKB

THE WELDON TOOL COMPANY

3000 WOODHILL ROAD · · · CLEVELAND 4, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 22

You can do more with these ALL NEW DELTA 17″ drill presses



Equipped with exclusive new Rockwell Power Feed, these presses can operate in remote control or be interlocked with automation devices. Available as original equipment or as an accessory on every model.

FREE BROCHURE—Complete specifications on the new Delta 17" drill presses and accessories. Write: Rockwell Manufacturing Co., Delta Power Tool Division, 622C N. Lexington Ave., Pittsburgh 8, Pa.

Here's a major engineering advance from Delta to give you increased drilling accuracy, more job flexibility and greater operating economy. You can choose from 76 models that incorporate these up-to-date performance features: New Internal Depth Stop Mechanism, Quick-set Depth Gage, Interference-free Guard and Pivot-type Motor Mount.

These drill presses are completely new—not merely improved or restyled—but actually redesigned to deliver consistent precision operation under the most rugged work loads with little or no maintenance.

Your Delta Industrial Distributor (listed under "TOOLS" or "MACHINERY" in the Yellow Pages) will gladly demonstrate how these 17's can save you dollars, hours and material. Why not call or see him soon!

DELTA INDUSTRIAL TOOLS

another fine product by

ROCKWELL

CIRCLE INFORM-A-GRAM KEY NO. 23

IT'S A FACT

FOR PRECISION HOLDING POWER
DAY-AFTER-DAY, YEAR-AFTER-YEAR

YOU CAN DEPEND ON
DE-STA-CO TOGGLE CLAMPS

Contour checking fixture with De-Sta-Co clamps quickly checks accuracy of parts against master template.

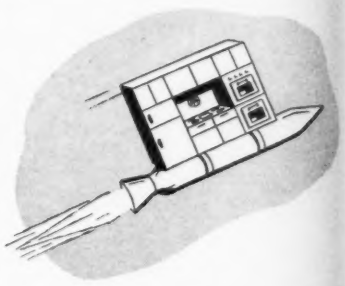
FOR MORE FACTS
phone, wire or write for NEW 36-PAGE CATALOG

TOGGLE CLAMPS
SHIMS AND SPACERS
DE-STA-CO
STAMPINGS
BLOWER HOUSINGS

DETROIT STAMPING COMPANY
340 MIDLAND AVENUE · DETROIT 3, MICHIGAN
CIRCLE INFORM-A-GRAM KEY NO. 24

Now, A Space Kitchen

The Whirlpool Corp., St. Joseph, Mich., manufacturers of home appliances, has been awarded the contract by Wright Air Development Div., Air Research and Development Command, USAF, to design and build America's first Space Kitchen. This experimental project calls for the development of a unit which could provide all foods and beverages required by three space pilots on a 14-day mission.

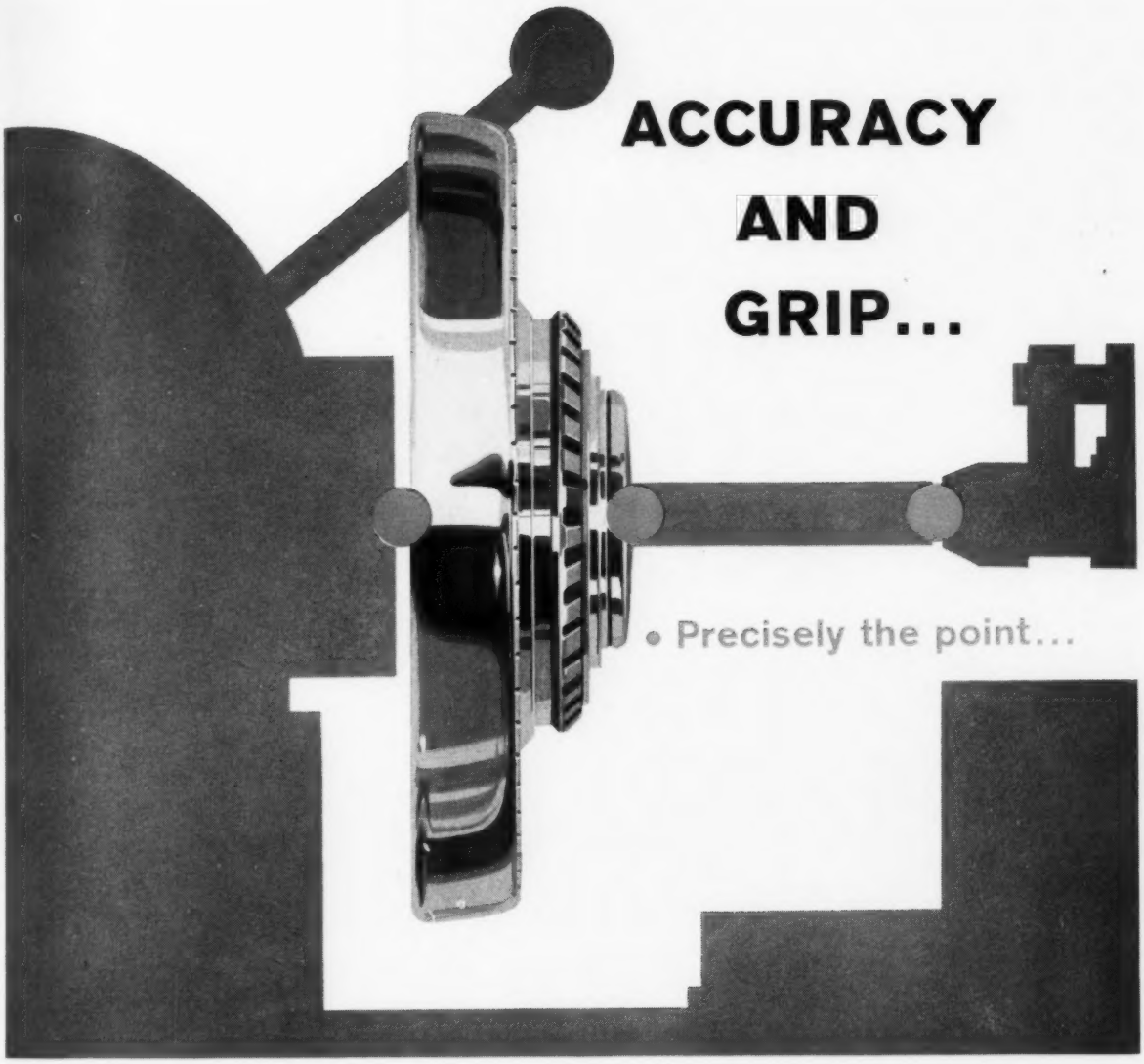


It will occupy an area approximately 10′ long and 7½′ in diameter within a multi-stage rocket. The space kitchen will contain a miniaturized, thermo-electrically fueled refrigerator and freezer, a three cavity oven and a built-in 2½ gal capacity water system with its own heater. None of the appliances will be used in the same manner as their earthly counterparts.

"During space flight," said Howard Brehm, Whirlpool Research and Development Project Coordinator, "the kitchen, the men and everything else within the capsule would be absolutely weightless." Danger of damage from flying utensils would be great, so because of the zero gravity, the Space Kitchen will function more as food dispensing center rather than an area in which food is prepared. Selection of solid foods and whatever preparation they might require will be a simple matter. The spacemen will place any food containers requiring heat in the oven and within 30 min this heating device will warm the food to 175°.

Water does not behave at zero gravity as it does under normal circumstances, but this has been solved by designing a manually operated positive displacement pressure pump into an air-free

. . . Continued on page 28



When you buy new tools or rebuild old ones

START UP FRONT

- Precisely the point where the tool does its work.
- Precisely the point where profits are made and lost.
- Precisely the point where the accuracy and grip of Jacobs Chucks reduce tool breakage, downtime and rejects.

This is precisely the point, start up front with Jacobs.

The Jacobs Model 91 is the world's finest lathe collet chuck. Developed expressly for the world's finest engine and tool room lathes. Modernize your lathes with Model 91.

- It has the **range**—each collet has full 1/8" range and set of 11 chucks any bar between 1/16" and 1 3/16".
- It has the **grip**—two to four times as much as split steel collet equipment.
- It has the **accuracy**—the world's most accurate collet chuck. Manufactured to maximum runout limits of .0007"—T. I. R. at the nose.

INDUSTRIAL TEAMWORK

Your industrial supply distributor knows your business. He is always ready to fill your needs quickly and economically. When you need chucks you can depend on this industrial team—Jacobs and your Jacobs industrial supply distributor.

Jacobs CHUCKS

THE JACOBS MANUFACTURING COMPANY,
WEST HARTFORD, CONNECTICUT

CIRCLE INFORM-A-GRAM KEY NO. 25

HARDINGE
ELMIRA, N.Y.

ACCURACY
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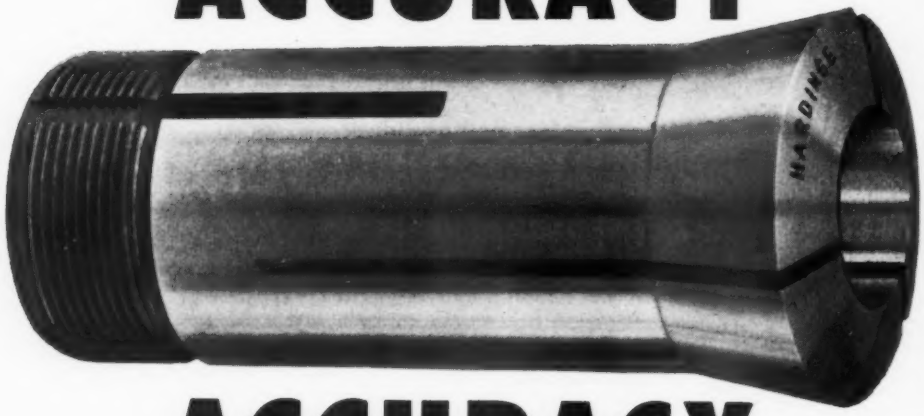
ACCURACY

70th ANNIVERSARY
1890 - 1960
HARDINGE
ELMIRA, NY



ACCURACY
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***HARDINGE** has specialized in the manufacture of collets since 1890.*
***HARDINGE** today stocks collets in sixteen principal cities in the United States and Canada.*
Ask for descriptive bulletins.

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE

Immediate stock delivery from Atlanta, Boston, Chicago, Dayton, Detroit, Elmira, Hartford, Los Angeles, New York, Philadelphia, Seattle, Portland, Minneapolis, Oakland, St. Louis, Springfield, N. J., and Toronto.

CIRCLE INFORM-A-GRAM KEY NO. 26

CADDY

AIR OPERATED
TOGGLE CLAMPS

CADDY AIR OPERATED Toggle Clamps are recommended for jobs requiring fast loading and unloading. Clamps are available in 3 models with clamping pressures from 400 lbs. to 1000 lbs. Furnished with air restrictor fittings to insure smooth operation. Clamps have double action air cylinders. Black rust-proof finish.

Bolt retainer furnished with each clamp.

FEATURES:

1. HEAVY DUTY ALL WELDED CONSTRUCTION—Will withstand extreme abuse—will not spring or bend under maximum load.
2. EXTRA LARGE PIVOT PINS—In actual test under load clamps have withstood over half a million cycles without excessive wear.
3. SMOOTH ACTION—Cylinder restriction fittings give cushioned clamping action.

CADDY® toggle clamp division

Erico Products, Inc.

2070 E. 61st Place • Cleveland 3, Ohio

IN CANADA: ERICO INCORPORATED, 7 Superior Ave., Toronto 14, Ontario, Canada

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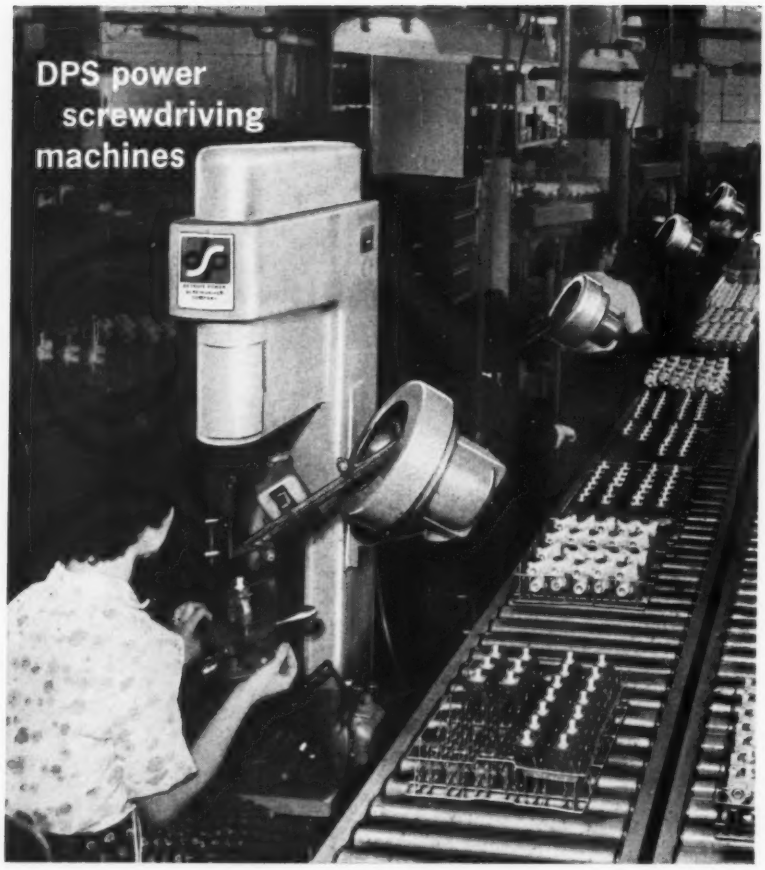


drive screws and nuts fast . . .
mar-free and accurately

Something as small as an inaccurately driven screw or nut can cause parts to be rejected. And that costs you money both in parts waste and time lost.

DPS Model U power screwdriving machines drive screws and nuts with the accuracy that improves assembly quality, reduces rejects. They give you speed, too. Drive up to 40 screws or nuts per minute.

The Model U is available in two types . . . pedestal and self-contained driving head. Both require only a minimum of space and are easily adaptable to your work flow. Feeder mounts on either side of machine column for right- or left-hand assembly. Other features include a positive control clutch which maintains constant driving torque, motorized hopper drive with safety clutch, and fully adjustable feed track and escapement mechanism.

DPS Model U drives screws from #6 x 3/16" long to 1/4" x 1 1/2" long and can be equipped with 12" or 16" rotary feeders. Write for Model U bulletin.

15,603

DETROIT POWER SCREWDRIVER CO.
A Subsidiary of Link-Belt Company

Selective Parts Feeders; Screw, Nut and Stud Driving Machines; Special Purpose Assembly Machines

2827 W. Fort Street
Detroit 16, Michigan
TAshmoo 5-3070

CIRCLE INFORM-A-GRAM KEY NO. 28

. . . Space Kitchen from page 24

water system. It meters out a preselected amount of air-free cold water. If hot water is needed, three pints of 185° water can be drawn every 2 hrs.

Once foods are prepared, the astronaut will place a mouthpiece on the container and squeeze food into his mouth.

Although Brehm and his group can think of many earthly features they would like to design into the Space Kitchen, their ultimate selection will be restricted to the features providing the greatest psychological benefits at the lowest possible weight.

The prototype Space Kitchen will be completed and delivered to the government before the end of April.

Western Metal Show

New metalworking ideas and developments will be introduced at the American Society for Metals' 12th Western Metals Congress and Exposition to be held at the Pan-Pacific Auditorium, Los Angeles from March 20-24. More than 200 exhibiting firms and 32 important technical sessions will highlight the theme "Idea Center for Industry — West."

The displays of new metalworking equipment, processes and products will be supplemented by practical ideas for immediate use.

Machine Tool Sales Rally Seen

The Value Line Investment Survey is pointing toward a comeback for the machine tool industry this year that will be a prelude to greater sales recovery by the mid-1960's.

The Survey bases its optimism on these conclusions: 1) the economy should turn upward after midyear; 2) the auto industry will step up its buying after a new labor contract is signed this Fall; 3) liberalized depreciation allowances may be forthcoming from the new administration, and 4) establishment of subsidiary plants abroad will protect the world competitive position of U.S. machine tools.

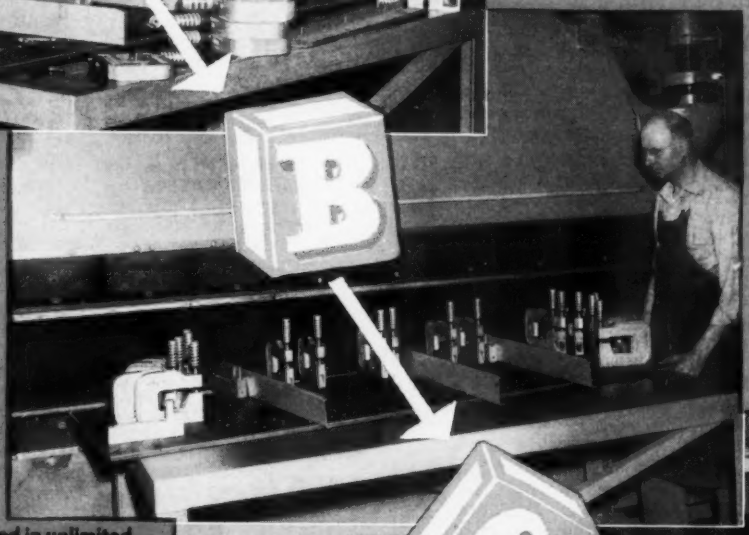
as easy as

UNIPUNCH

PERFORATING UNITS

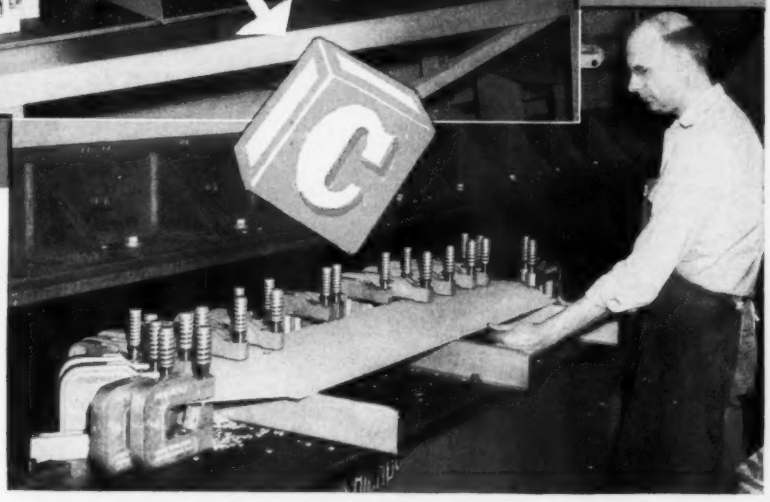
Fast, simple set-ups of hole-punching patterns is only one of the many economical advantages of Unipunch Tooling. Wide interchangeability of punches and dies plus cost saving design make it logical to STANDARDIZE ON UNIPUNCH HOLE-PUNCHING AND NOTCHING EQUIPMENT.

A Unipunch Hole-Punching Units being set-up on a template outside of the press brake.



B Showing the complete set-up being placed on press bed.

C Punching holes in the work with the first stroke of press ram. No aligning of punches and dies. The same group of units may be used in unlimited set-ups for greater economies.



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CIRCLE INFORM-A-GRAM KEY NO. 29

TECHNICAL BOOKS . .

HUEBNER PUBLICATIONS, INC.
1975 LEE ROAD, DEPT. E
CLEVELAND 18, OHIO

Gentlemen: Please send books checked.

- ☐ **THE ACCURACY & GEOMETRY OF PRECISION SURFACE PLATES, ANGLES & STRAIGHT EDGES** by E. Willard Pennington. **$ .75**
- ☐ **ADHESIVE BONDING OF METALS** by George Epstein. 1954; 227 pages. Types and strengths of adhesives, joint factors, etc. **$2.95**
- ☐ **BRAZING MANUAL** prepared by the Committee on Brazing and Soldering, American Welding Society. 1955; 208 pages. Practical information on every type of brazing problem, including tables. **$4.75**
- ☐ **COLD FORMING OF STAINLESS STEELS** by Lester F. Spencer. A 28-page pamphlet on the subject. **$1.00**
- ☐ **DIAMOND TECHNOLOGY** by Paul Grodzinski. 784 pages. 93 working tables, and over 486 photographs and drawings. The only standard work on the subject. **$10.00**
- ☐ **DICTIONARY OF METALLURGY** by A. D. Merriman. 400 pages profusely illustrated. 7,000 definitions. 236 tables. **$25.00**
- ☐ **DIE DESIGNING & ESTIMATING,** 4th edition. 363 pages; 26 chapters; over 400 illustrations. A standard reference work. **$7.50**
- ☐ **DIE ESTIMATING** fourth edition. Provides the KNOW-HOW for determining what it takes in units of time to build a die. 62 pages. **$3.00**
- ☐ **ELECTROPLATING ENGINEERING HANDBOOK** edited by A. Kenneth Graham. 1955; 670 pages. Complete engineering fundamentals and processing data on all phases of electroplating. **$10.00**
- ☐ **FASTENERS HANDBOOK** by Julius Soled. 1957; 450 pages. Complete data, illustrations and descriptions covering all currently available industrial fasteners. **$12.50**
- ☐ **GEARS FOR SMALL MECHANISMS** by W. O. Davis. 20 chapters profusely illustrated covering theory, design and practice in cutting and generating gear tooth forms. **$5.00**
- ☐ **HANDBOOK OF BARREL FINISHING** by Ralph F. Enyedy. 1955; 288 pages. Every phase of barrel finishing, including over 150 complete specification sheets and latest development. **$8.25**
- ☐ **HANDBOOK OF LAYOUT & DIMENSIONING FOR PRODUCTION** by Hyman H. Katz. 479 pages. The functional principles of dimensioning in clear, interesting, succinct English. **$15.00**
- ☐ **HOW TO DESIGN & SPECIFY PRINTED CIRCUITS** Reporting on advantages, layouts, design, selection of materials and components etc. **$5.00**
- ☐ **BORING** methods, machines and miscellany for making close-tolerance holes by W. E. Hoffman. **$ .75**
- ☐ **INSTRUMENTS FOR MEASUREMENT & CONTROL** by Werner G. Holzbock. 1955; 416 pages. Fully describes, illustrates and compares all current devices for measuring and controlling temperature, moisture, pressure, flow, uniformity, etc. **$10.00**
- ☐ **MACHINING, HEAT TREATMENT & PICKLING OF STAINLESS** by Lester F. Spencer, 36 pages on the working of stainless steel. **$1.50**
- ☐ **MANUAL OF MACHINABILITY AND TOOL EVALUATION** by Antoni Niedzwiedzki. Tool life formulas, tool life criterion, chip load and workpiece hardness, tool geometry, test records, tool inspection, machinability classification, machine tool selection, and much other valuable data including graphs, drawings and recommendations. **$6.00**
- ☐ **MATHEMATICAL PROGRAMMING** by Reinfeld & Vogel. 274 pages. The practical application and use of mathematics in industrial programming. **$8.00**
- ☐ **MICROSTRUCTURES OF DIAMOND SURFACES** by S. Tolansky. 11 chapters of original research. New optical techniques explained. **$8.50**
- ☐ **PLASTICS ENGINEERING HANDBOOK,** compiled by The Society of the Plastics Industry. 850 pages. **$15.00**
- ☐ **THE PRINCIPLES OF INVENTORY MANAGEMENT** by Nyles V. Reinfeld. An authoritative 32-page treatise on the economic aspects of analysis within your existent inventory control system. **$2.00**
- ☐ **PRINCIPLES & METHODS OF SHEET METAL FABRICATING** by George Sachs. 1951; 537 pages. Describes in detail sheet metal forming methods, metallurgical effects in stamping, drawing, extruding, bending; design of parts and dies, etc. **$11.00**
- ☐ **PRODUCTION CONTROL** by Nyles V. Reinfeld. 1959; 340 pages. A practical guide to the principles and functions of production control—details forecasting, scheduling and inventory techniques—incorporates up-to-date research from 500 companies. **$8.00**
- ☐ **PROTECTIVE COATINGS FOR METALS** by Burns and Bradley. 2nd edition. 1955; 657 pages. Latest information on the composition, properties and performance of metallic and organic coatings. **$12.50**
- ☐ **TECHNICAL WRITING MANUAL** by Christian K. Arnold. A glossary of word usage for technical people. **$2.50**
- ☐ **TECHNIQUES OF PRESS-WORKING METAL** by Eary & Reed. 472 pages. 20 chapters and hundreds of drawings cover this subject in highly comprehensive detail. **$12.00**
- ☐ **TREATISE ON MILLING & MILLING MACHINES** by The Cincinnati Milling Machine Co. 896 pages, over 200 formulas and 700 illustrations and charts. **$8.00**

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The most complete source for

* CARBIDE DIES
* STEEL DIES

BEFORE YOU RE-TOOL, we strongly urge you to make use of our Customer Consulting Service for recommendations as to what type of die would be best for your application. A typical example is the way more and more manufacturers are turning to Harig Carbide Dies because of the tremendous cost-saving advantages resulting from less downtime—longer runs—lower maintenance.

Harig's many years of experience and know-how in engineering and building dies is at your service—from the simplest to the most complicated designs, of carbide or steel. Phone or write us today and a Harig engineer will be happy to call at your plant, at your convenience.

NEW HARIG BROCHURE

...loaded with information on Harig carbide and steel dies, photos of plant facilities, charts, etc.

JUST WRITE, "SEND HARIG BROCHURE" ON YOUR LETTERHEAD

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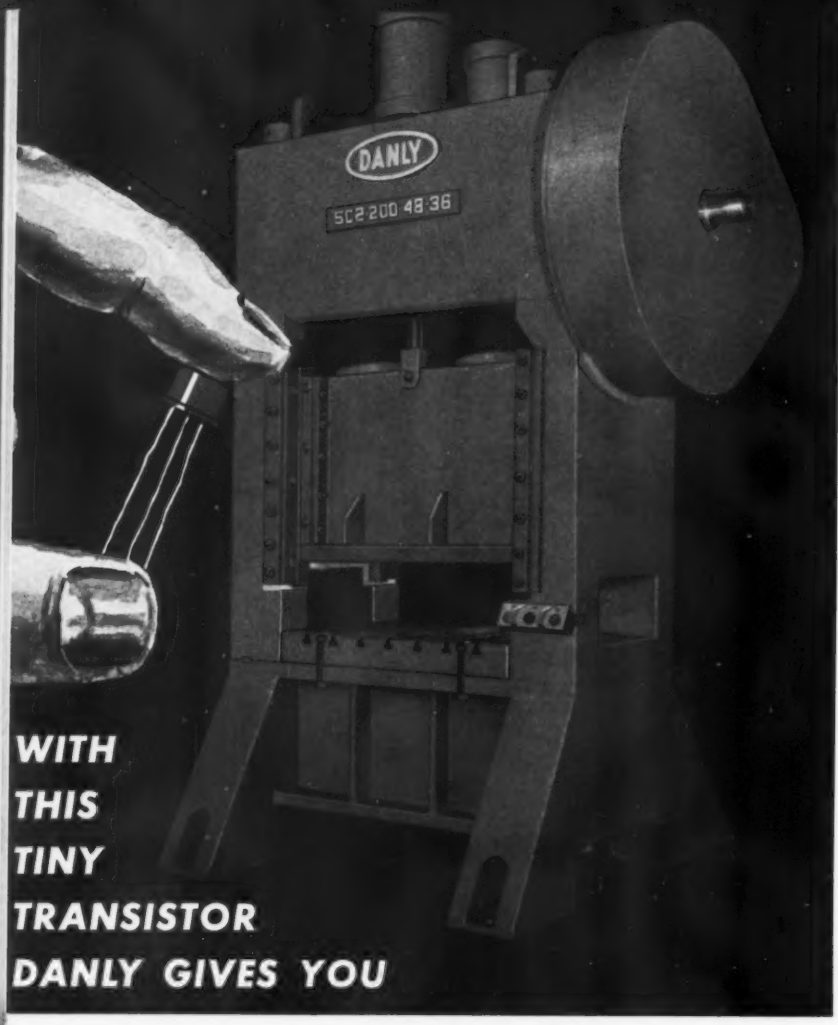
Products by Harig Machine Tool Division

CIRCLE INFORM-A-GRAM KEY NO. 31



WITH THIS TINY TRANSISTOR DANLY GIVES YOU

AUTOMATIC SLIDE POSITION TO ± .005!

The operator sets a dial for proper shutheight. **Danly's Positioning Control** automatically adjusts the slide within .005″ of the precise height desired! And with repeatable accuracy of ±.002!

This transistorized time-saver is typical of Danly developments in electronic controls . . . imaginative engineering to further improve the performance of any Danly Press. Other Danly controls include: **Danly Speed Control** for constant speed with varying loads; **Danly Proximity Control** to provide accurate switching without physical contact; **Danly Load Indicator** for direct readings of load; **Danly Motion Detector** to monitor speed of shaft, slide or table.

DANLY®

CONDENSED PRESS CATALOG and new control bulletins give you a package full of reasons why you should invest in a Danly. Write for your package today.

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DANLY

DANLY MACHINE SPECIALTIES, INC., 2100 South Laramie Ave., Chicago 50, Ill.

CIRCLE INFORM-A-GRAM KEY NO. 32

She's A Senior Scientist

The appointment of Dr. Mary Beth Stearns to senior scientist in the physics department of Ford Motor Co.'s Scientific Laboratory was announced recently by Dr. J. E. Goldman, associate director for basic research.

Dr. Stearns, a native of Minneapolis, will conduct programs combining the techniques of nuclear and solid state physics.

A graduate of the University of Minnesota, she received her Ph.D. in nuclear physics from Cornell University.

Dr. Stearns has been a research physicist at Carnegie Tech studying mesonic atoms; helped set up a research program investigating gamma rays from deuteron-proton reactions with the University of Pittsburgh's cyclotron; and was a solid-state physicist with General Atomic, a division of General Dynamics Corp., at La Jolla, Calif., where she conducted thermoelectric research.

Translations From Soviet Coming

Important Soviet books, monographs, symposia, conference proceedings and collections, all on highly scientific and technical subjects, will continue to be translated into English for the next 6 yrs.

This was assured recently when Consultants Bureau, the New York publishing house which has been handling these translations, signed a contract with the official Soviet book export agency. Terms give Consultants Bureau exclusive world rights to reproduce this material in English.

Now Machining Beryllium

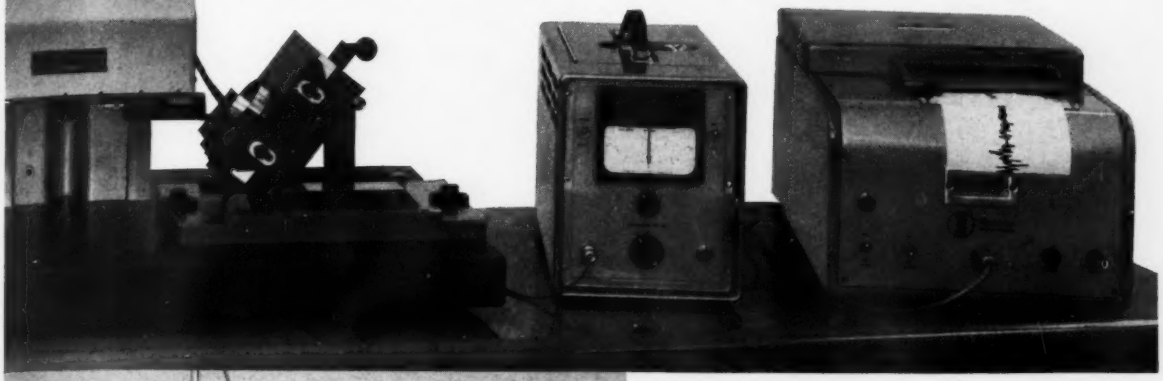
A new entry into the fast-growing field of manufacture of beryllium parts is Vinco Corp.'s Detroit Div. Their experience in the manufacture of ultra-precision metal parts, high precision gages, tools, and checking and production instruments will be applied to the complexities of close tolerance machining of space age metal.

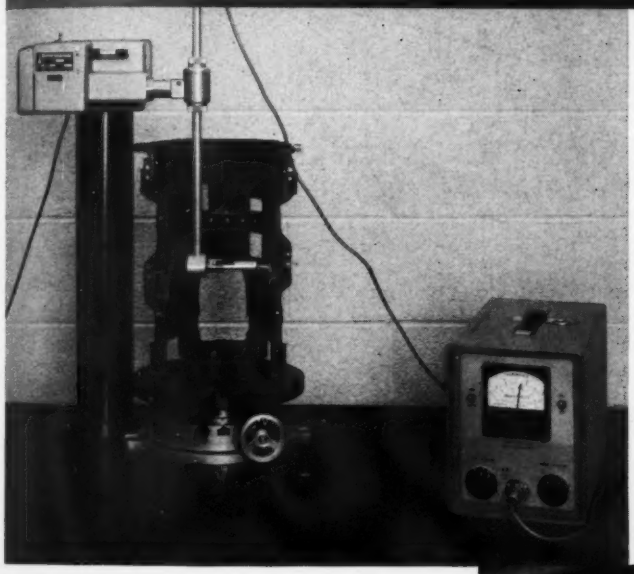
BREAKING MEASUREMENT BARRIERS WITH MICROMETRICAL

HOW TO SEE A SHAPE IN MILLIONTHS

To assure desired quality, a manufacturer needed to production-check the crown of tapered roller bearing components in millionths of an inch. Electronic indicators proved inadequate; so they came to Micrometrical. The result is the Microcorder® setup shown.

With the work positioned on a sine plate, a positive-displacement Tracer moves across the raceway, and a recorder draws a magnified profile of the surface. Each ¼" division on the chart represents a vertical distance of .000100" or .000025", as desired; so the contour is readily scaled in millionths. The equipment is used in the grinding room—for checking bearing cups, cones and rollers. BULLETIN LT40 gives details. Write for it!





FOR BOOM WITHOUT BUST—

In the Vulcan aircraft cannon, an internal cylindrical cam surface is critical to performance; and the manufacturer has to measure the roughness of this surface at many places. To do so quickly and easily, he uses the Profilometer® setup at left. This includes (1) a standard Linear Pilotor mechanism on an extra-high column; (2) a special Tracer (at bottom of vertical tube) that positions itself to all slopes of the cam; and (3) a standard Amplimeter, which shows the roughness height in microinches (arithmetical or RMS average). Ask for BULLETIN LT41.

Bring YOUR surface measurement problems to

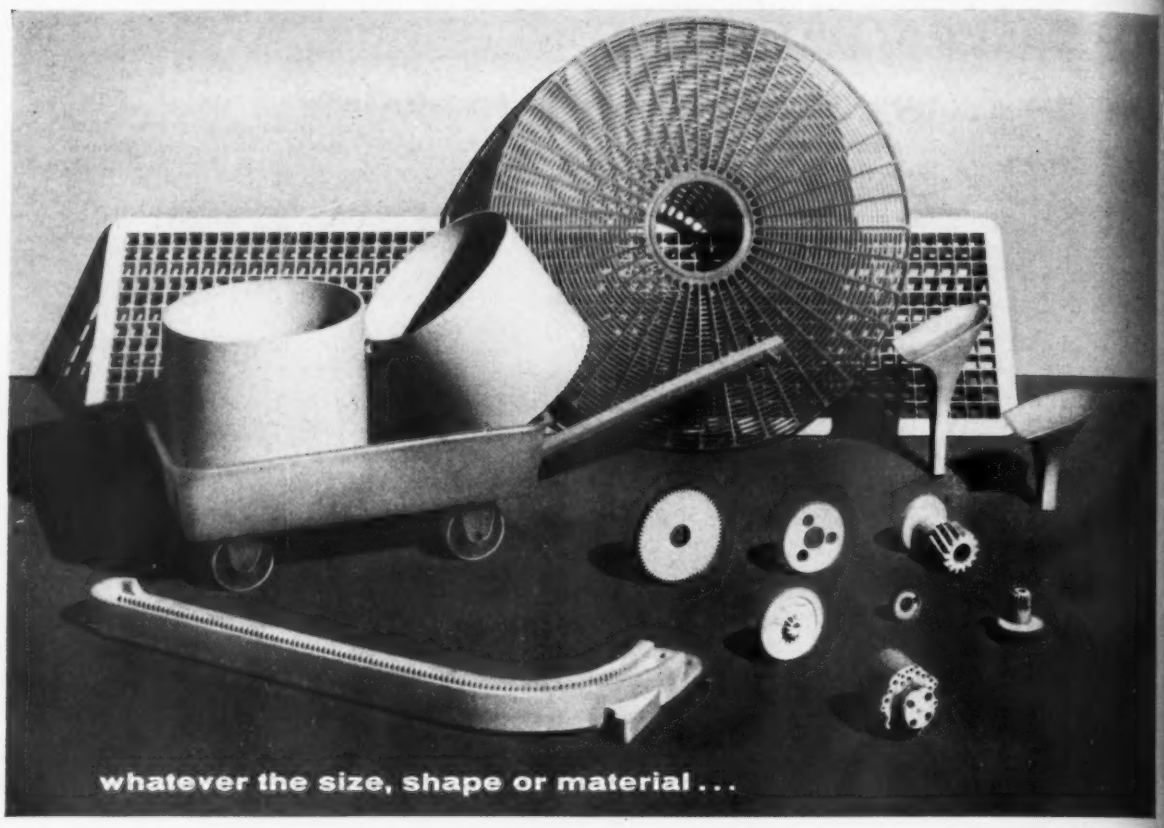
MMC® MICROMETRICAL MANUFACTURING COMPANY
3821 S. STATE RD. ANN ARBOR 6, MICHIGAN

Manufacturer of the PROFILOMETER® • PROFICORDER® • MICROCORDER®
WAVOMETER® • ANDEROMETER® • VAROMETER®

SELF-PROPELLED THICKNESS CHECKER

The Microcorder® equipment at right is filling a steel mill's need for rapid edge-to-edge thickness checking of rolled steel. A self-propelled Pilotor with built-in Tracer moves along a sample strip, while a recorder draws a continuous chart that shows the size, shape and location of variations from nominal thickness. This is much faster, more accurate and more complete than previous methods—takes only 60 to 90 seconds for a 96" strip—and permits a 60% reduction in rejects caused by ridges. BULLETIN LT42 gives details. May we send you a copy?

CIRCLE INFORM-A-GRAM KEY NO. 33

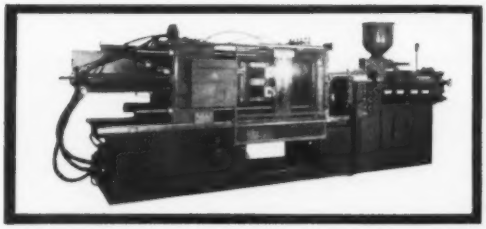


there's a FELLOWS to mold it best!

Within the range of 3-oz. to 20-oz. shots, for high precision or mass production with almost any resin you can name, Fellows machines deliver the finished parts faster and with fewer rejects.

The four automatic Fellows Injection Molding Machines are sensitive and accurate. Their built-in controls simplify set-ups and make it possible for one operator to handle two or more machines at the same time.

A wide variety of optional special attachments makes possible the automatic production of pieces with threads, undercuts, side cores and other "hard to mold" characteristics. Ask your Fellows Plastics Specialist for complete information.



MODEL	3-125	6-200	6-10-225*	12-350
Rated Capacity (ozs.)	3-4.5	6-9	6-10	12-20
Max. Mold Size	12 x 17″	15 x 21″	15 x 25″	20 x 32″
Mold Locking Force (tons)	125	200	225	350
Mold Opens	5-8″	6-9″	8-14″	10-20″
Dry Cycles (per hr.)	600-840	490-650	700-825	600-800
Horsepower	15	20	20	40
KW Heater Unit	6	12	14	21
Plasticizing lbs. per hr.	45	75	100	150

*6-10-225 machine also available with optional 30 HP motor, changing dry run speed to 825-925 cycles per hour and optional oversize "large-inventory" heating cylinder at extra charge.

THE FELLOWS GEAR SHAPER COMPANY
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Fellows
injection molding equipment

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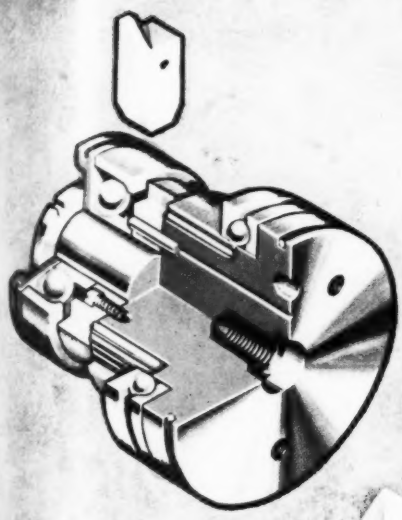
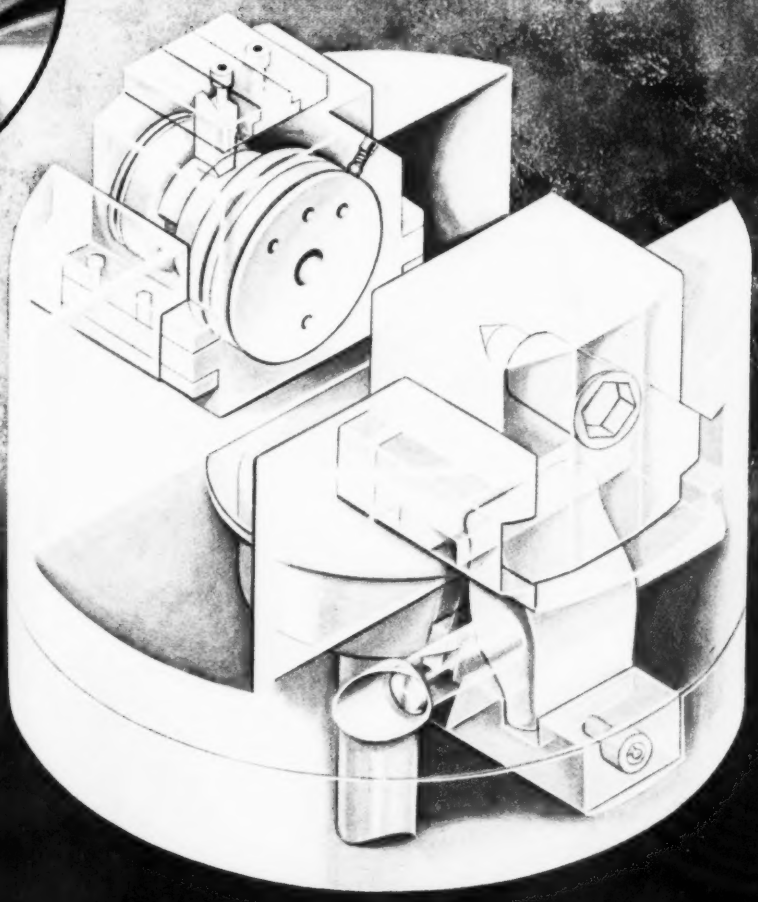
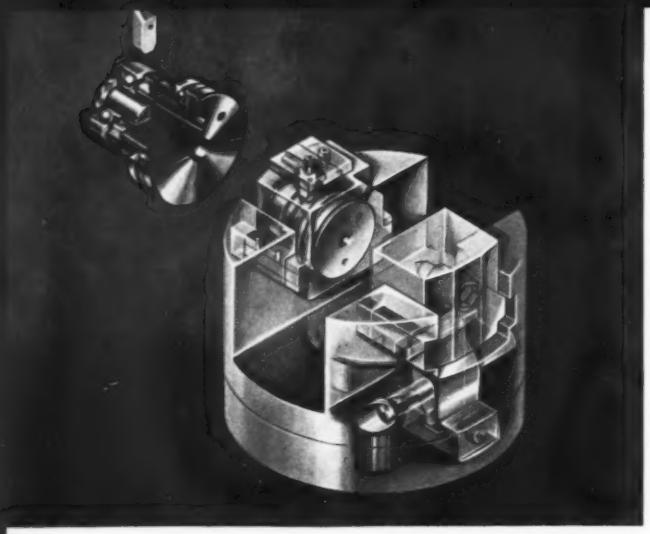




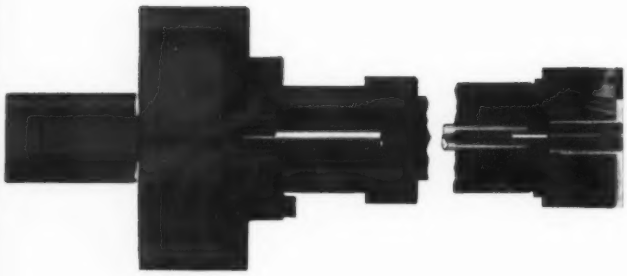
Here is another major chuck development from SKINNER



A heavy-duty power chuck with jaws that freely index under full pressure. Indexing is simple, easy, and fast. The operator can index manually without touching the work or releasing the pressure. Jaws are indexed by means of a lock screw and slide plate. Note the size and shape of the indexing pin. It fits firmly and positively into the indexing plate so that extreme accuracy of indexing is assured.

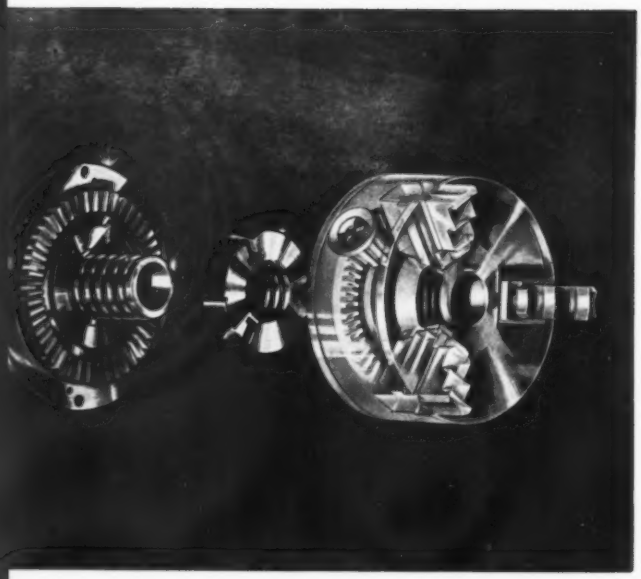
One or both jaws can be furnished with indexing mechanisms. As a result, you can index more positions and smaller index angles. There is no need to buy a new chuck for different indexing positions because index jaws or index components can be interchanged quickly and easily.

This new Skinner chuck is available in all body diameters from 12″ through 36″.



The only power chucking unit for Brown & Sharpe and similar automatic and hand screw machines. The addition of this unit to your screw machine permits power chucking of cold drawn parts, small or odd shapes and castings.

The Skinner unit, recommended by Brown & Sharpe, consists of a 4-inch air chuck with two or three jaws and work ejector, a threaded draw bar, a rotating air cylinder and a cylinder adapter. Hand, foot, or solenoid valves and power chucking accessories are also available. Average installation time—ninety minutes.



The first major chuck development in fifty years! This extra-heavy-duty Wedge-Screw chuck develops tremendous gripping power, high accuracy and repeatability by a unique principle. When the lug-type pinion is turned manually or by a power wrench, it engages the gear plate causing the screw to move the wedge. The force of the wedge on the jaws holds the work with tremendous power.

This Wedge-Screw chuck has such useful features as:

Accuracy—within .001 total indicator reading

Repeatability—within .0005 total indicator reading

Complete Range—no size limitation

Many other features including over-tightening and operator protection, sealed operating mechanism, automatic lubrication, etc.

For more information about these major chuck developments, contact your Skinner representative or write directly to us.

SKINNER CHUCKS®

THE CREST OF QUALITY

SKINNERCHUCKS

SKINNER-HORTON CHUCK DIVISION
SKINNER PRECISION INDUSTRIES, INC. • NEW BRITAIN, CONNECTICUT, U.S.A.

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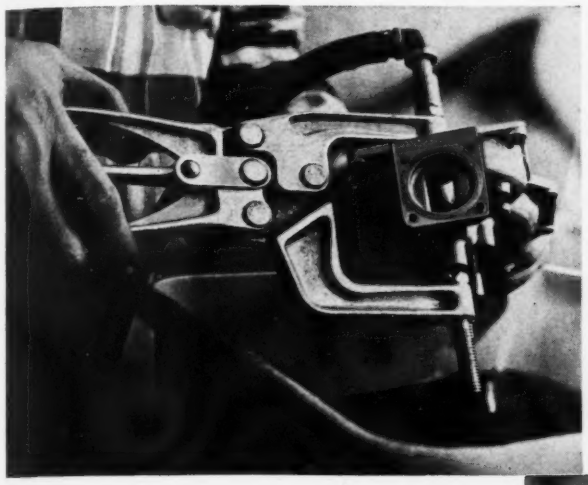
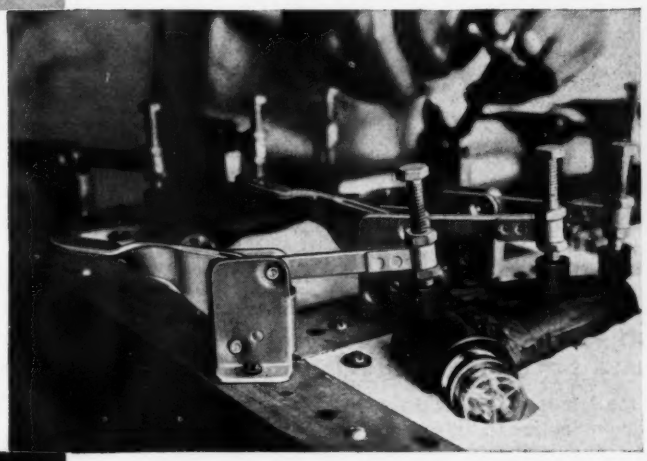
Look what clamps are doing!



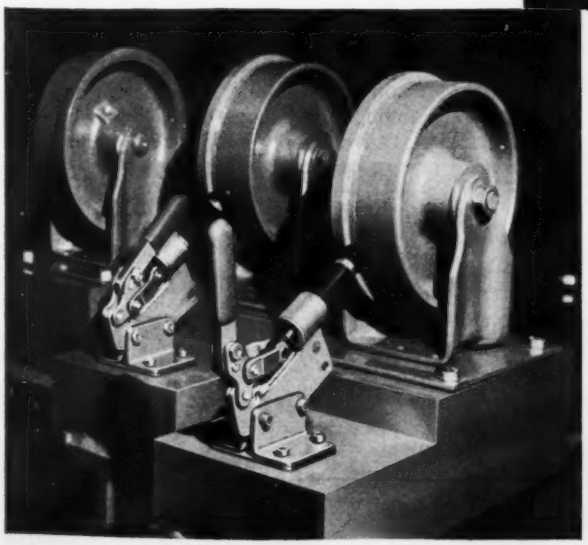
Practical uses of Wespo Toggle Clamps and Pliers that may suggest ways you can save

Toggle plier serves as low cost fixture for testing castings The air line is connected through one jaw of a Wespo Model 522 Toggle Plier. The plier is then clamped onto the casting and air applied by a foot control. Immersing the casting into a tank quickly spots any defects. Patented "Quick trigger" feature of the Model 522 instantly releases the casting; speeds testing. Rugged, lightweight Wespo toggle pliers are available in various jaw capacities and sizes.



Holding these glued parts together while drying is a simple task with Wespo Horizontal Bar-Type Toggle Clamps. Neoprene-capped spindles prevent damage to plastic surfaces, yet securely hold the parts during the drying operations. Wespo toggle clamps are available in more than 80 types and sizes. So, the next time you think clamps, think Wespo!

Simple, low cost "parking brake" for this track-operated frame is provided by a Wespo Push-Pull Clamp equipped with a neoprene-capped spindle. "Brake" is quickly applied or released by a simple flick of the wrist. Wespo Push-Pull Clamps are available in various sizes and holding pressures and are ordinarily used on holding fixtures where push or pull clamping is required.



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Ask your Wespo distributor for your free copy of this 16-page Wespo catalog. It will help you quickly select the right clamp for every clamping job.

WESPO

DIVISION OF VLIER ENGINEERING CORPORATION
26935 W. Seven Mile Rd., Detroit 19, Michigan
Formerly West Point Manufacturing Company

CIRCLE INFORM-A-GRAM KEY NO. 36

CIRCLE INFORM-A-GRAM KEY NO. 37

Complex job–or simple job

Kingsburys save money on both

600 valve castings per hour gross with a 14-spindle indexing machine

At the left is high production with a variety of tools — five combination tools, two drills, a hollow mill, a recessing tool for the undercut, a counterbore and three taps.

A 30-inch index table holds seven fixtures. Steel jaws in each fixture hold two parts, one in front for the first chucking and one in back for the second. A spring-loaded ram clamps the parts and an air cylinder unclamps them.

Nine self-contained units perform the operations. Seven have single spindles. Two vertical units have multi-spindle heads; each operates at two stations and in both chuckings.

The machine also handles a part with another tapped hole. The units cycle in 4.5 seconds, and the table indexes in 1.5 seconds, so a part can be finished every 6 seconds.

325 aluminum housings per hour gross with a 6-spindle non-index machine

The machine at the right has one fixture. Clamping is manual. Two opposed units drill two holes in line. To avoid tool clash one unit cycles, then a cam-controlled valve trips the other. A vertical unit taps four holes.

Kingsbury machines save money because they produce uniform parts that gage. Good basic design and rugged accurate construction mean few rejects and little down time.

Kingsbury Machine Tool Corporation, Keene, N. H.

KINGSBURY MULTI-UNIT AUTOMATICS

Work–or wait and see?

LET'S DROP THE WAIT-AND-SEE ATTITUDE — and get to "work."

There are too many negative "sounds" at the beginning of every year. They ooze caution and pessimism, which do nothing but harm our total economy.

Too few businesses go to work at the beginning of each year according to their own "green light." Too many wait for the right "indication" between the lines of the pessimistic drivel they depend upon for guidance. Too few in the trade press have anything constructive to offer, and yet they are expected to say something.

Later in the year these same economy predators come up with the positive stuff timed with the actual happening — constructive stuff they didn't have the guts to predict earlier.

So why pick on my colleagues? Because we all need shaking up now and then. But more to the point, some of you need shaking up to be reminded that "work" is the only sure way.

Among the caution spreading headlines that cause industry to sit on its hands, are: Profits To Drop, Industry Lacks Optimism, Things Better . . . after first half, Can We Hold The Line?, Will Costs Climb?, Few Foresee Any Upturn In 1961, and Recession To Fade In Fall.

These were all joy items under one cover—there were more. One more "profound" statement was made: "Sales Are The Key To Profits."

Phooey!! "Work" and more of it is the key to the whole thing — just plain hard work.

Read to keep abreast, but don't let it keep you from "work" coupled with imagination.

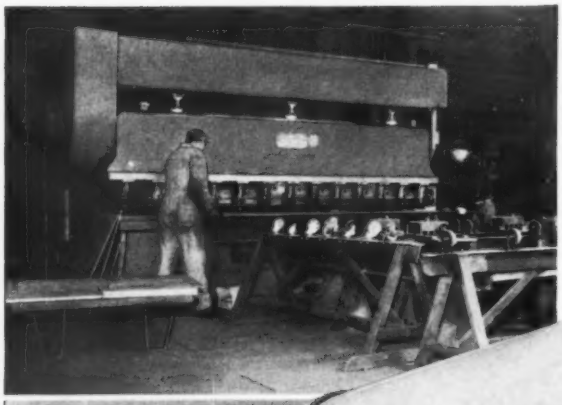
William S. Hoffman
Editor

CIRCLE INFORM-A-GRAM KEY NO. 38

CUTS MILLIONS OF FEET OF STEEL SQUARE and ACCURATE

Steelweld Shear Speeds Big Pipe Line Shearing

This shear cuts pipe line plate accurately. It has been doing so for years with only minimum maintenance.



Three completed pipes ready for shipment. Size: 35'-6" x 54" dia. x ⅜" wall. Weight each: 9,315 lbs. Part of an order for 24,500 feet.

Other typical pipe orders: (a) 600 feet of 72" dia. x ½" wall; (b) 15,500 ft. x 48" dia. x ⅜" wall. All plates used for these pipes cut on four sides by Steelweld Shear illustrated.

Dominion Bridge Company, Ltd., is the largest steel fabricating concern in Canada. Among its many activities is that of making steel pipe for Canadian pipe lines. At its Pacific Division, Vancouver, B. C., pipe is made in various diameters, mostly 3'-0" to 5'-0", and usually in lengths of 35'-0" to 40'-0". Pipe walls generally range from ¼" to ½".

One typical order called for 35 miles of 36" pipe in 40'-0" lengths with ¼" and 5/16" walls. This required 10,000 tons of steel. Five to seven plates were used for each pipe. Each plate was cut on all four sides to assure accuracy and squareness required for perfect fitting. Over a million feet of steel was sheared for this job — all on one Steelweld Shear.

The machine worked 15 hours a day, cutting 12,000 to 14,000 feet. The knives needed turning to a sharp corner every 2 to 2½ months, which meant that only after 8 to 10 months of continuous production shearing was regrinding necessary.

Heavy construction of the shear, Steelweld's own air-operated clutch, easy knife adjustment to suit metal thickness, and electric foot switch control, are some of the factors contributing to the success of Steelwelds on hard service jobs.

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PIVOTED BLADE *Mechanical and Hydraulic* **SHEARS**

Steelweld Machinery includes: Mechanical & Hydraulic Shears and Press Brakes, One-, Two- and Four-Point Straight-Side Presses, Speed-Draw Presses.

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CIRCLE INFORM-A-GRAM KEY NO. 40

TOOLING & PRODUCTION

The Magazine of Metal Working Methods

VOL. XXVI, No. 12
MARCH 1961

Tips On Drill Pointing

The right drill point for the right job means better tool performance. Drill manufacturers can supply a variety of points for different uses, but can't anticipate all production needs. These hints show how a drill user can select the proper point and modify points to meet new production conditions.

by W. R. Russell

Mr. Russell is Manager of Product Design & Application Department, The Cleveland Twist Drill Company, Cleveland, Ohio.

ONE OF THE MOST IMPORTANT FACTORS in obtaining maximum economy using twist drills is the proper selection and grinding of drill points. The point makes the first contact with the metal into which a hole must be drilled, and continues to do cutting throughout the entire operation.

Quality twist drill manufacturers provide drills with basic point styles best suited for the type of work for which the drill is intended. However, if job conditions change, and performance problems are encountered, the basic point can be altered to suit the new requirements. A modification can, in many cases, restore the economical operation of the drill.

Hard materials are often more effectively drilled with included angle points between 135° and 140°. Conversely, it has been found that cast iron and some of the softer materials are most efficiently drilled with included angle points between 90° and 100°.

Benefits obtained from changes in drill point angles are derived from the changes that occur in the thickness and width of the chips produced by the cutting lips. For example, drills with small included angle points have long

Fig. 1 Effect of point angle on axial rake.

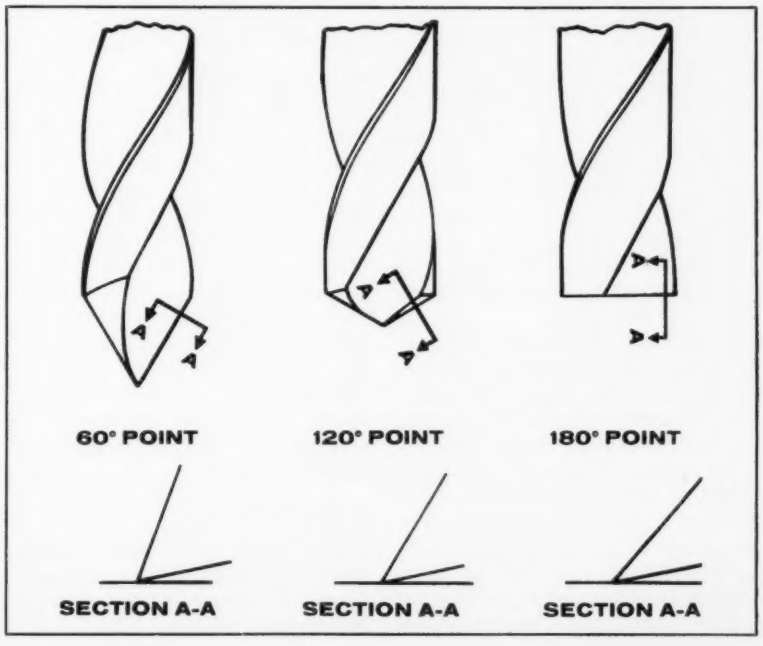


Fig. 2 Long ribbon chip is difficult to remove and limits coolant flow to drill lips.

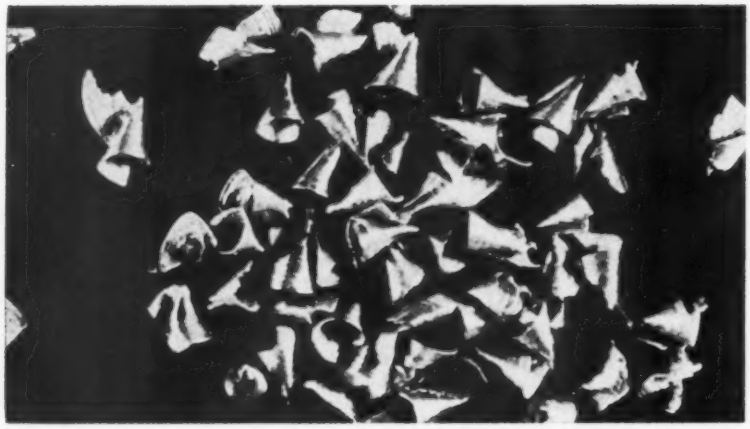


Fig. 3 Easy to handle short chips can be produced by proper drill pointing.

cutting lips, and therefore produce chips that are wide and relatively thin. Large included point angles have short cutting lips that produce narrower and thicker chips. In general, large included point angles are preferable in deep hole work because the narrower and thicker chips can be more easily removed.

A close examination of drill point geometry shows that changes in the included angle of the point result in changes in the effective rake at the cutting lip. This is illustrated in Fig. 1. Note that the effective rake of the helix angle of the drill is considerably reduced when small included angle points, with their attendant long cutting lips, are used.

As the drill point lengthens, the radial rake in the flute decreases, making the wedge angle of the cutting lip less acute. The strength of the cutting lip is also increased.

Conversely, the positive rake effect of the helix angle is increased with the use of larger included point angles of 135° and greater. Maximum positive rake at the point, and thus increased cutting efficiency, is obtained when the tool has a completely flat point or 180° included angle. This type of point is common to bottoming work and is typical of end mill construction.

Control of Chip Shape

By varying drill point geometry, the characteristics of the chip produced in any given material can be changed.

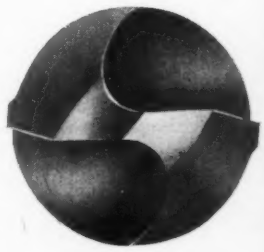
The long ribbon chip, (Fig. 2), associated with some of the softer, low carbon steels, is one of the most difficult to remove and is prone to over-lap and pack in the drill flutes. This reduces the volume of coolant reaching the drill lips. Other difficulties of long ribbon chips are that they may seriously interfere with the performance of adjacent tools and present a serious hazard to the operator.

To obtain the short, curled, broken chip (Fig. 3) that is ideal for removal by the drill, and disposal in the machine itself, several different configurations of drill points are available.

The double angle point shown in Fig. 4, widely used for drilling cast iron, has been quite effective in chip breaking. This point is ground with the conventional 120° included angle central portion, and a 90° included angle chamfer on the outer portion of cutting lips. The chip flow paths from the two separate cutting lips intersect, and it is this interference in chip flow that assists in chip breakage.

One of the most common and

Fig. 4 Double angle point.



easily-applied point variations is the flatted cutting lip, Fig. 5, widely used in the brass industry. The application of this flat reduces the effective axial rake to the range of 0° to 5° positive. Such reduction causes a pushing or plowing of metal rather than a shearing action. The reduction in axial rake also strengthens the cutting lip, and is commonly applied where chipping of cutting lips is a problem.

Another variation of drill point geometry, the radius undercut lip, is also illustrated in Fig. 5. This type of undercut is commonly used in single point turning tools, and its application to a drill lip is both practical and effective. The undercut lip is the opposite of the flatted lip, since the effective axial rake is increased and the direction of chip flow is such that the chip is turned back against itself, thereby effecting chip breakage.

Chip breaker grooves in the face of the flute or across the drill point clearance area are not nearly as common today as they were a few years ago. Their major effect is that of reducing chip width. They are usually applied to extremely deep oil-feed drilling work, where very narrow broken chips are required. They are almost always used in combination with either the radius undercut lip or the flatted cutting lip point geometry.

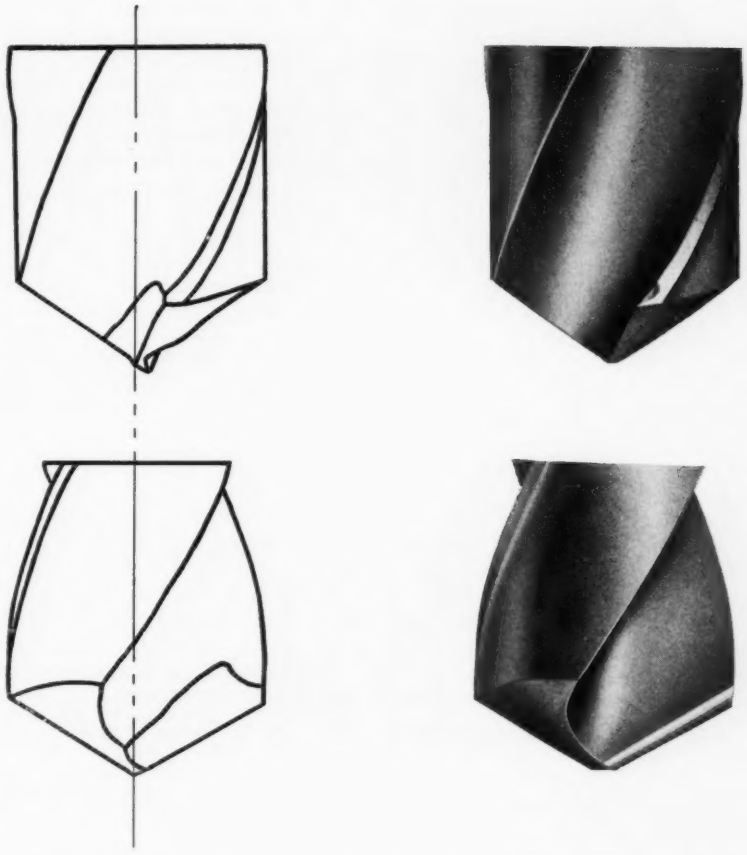
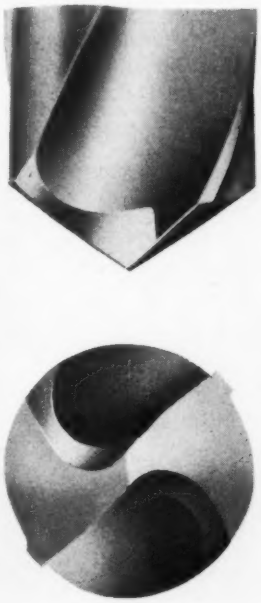


Figure 5

Fig. 6 Ordinary shop thinned point.



Web Thinning

Proper thinning of the web at the drill point is of utmost importance to drill performance. Since the web increases in thickness toward the shank end of the drill, it must be thinned at the point when the drill is shortened by regrinding. Thinning of the web reduces the pressure requirement for penetration of the drill into the work.

Ordinary shop thinning shown in Fig. 6 is usually done on the corner of the grinding wheel in a free-hand style. It is one of the simplest and most effective means of maintaining proper web thickness or correct length of chisel edge at the point of the tool. This thinning is easier to apply on general purpose tools with conventional web thicknesses than it is on tools with extremely heavy webs. As in all point thinning, special attention must be given to avoid forming constricted areas that become chip traps.

The thinning of heavy duty, heavy web drills, used for forgings or difficult-to-machine materials, presents a somewhat different problem. Here special attention must be given to maintaining drill point strength. The offset or crankshaft point shown in Fig. 7 is one of the most common means used to thin heavy web drills. Excessive degrees of secondary clearance or heeling must be avoided to maintain drill point strength. This thinning results in the lowest thrust. This feature is of tremendous importance in portable drill-

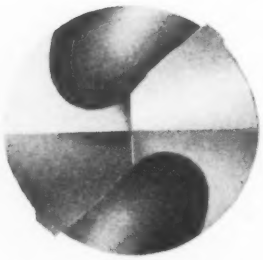


Fig. 7 Offset or crankshaft point.

ing where an operator's ability to push or put pressure on the drill is quite limited.

One of the better ways of thinning heavy duty drills is the center notch commonly used in thinning heavy web oil feeding drills. This thinning, shown in Fig. 8, is characterized by an open notch at the center of the drill that reduces the web at the point to about 8% of drill diameter and, in effect, produces a new cutting lip for the center ¼ length of the lip. The generous radius provided in this notch insures uninterrupted and easy chip flow away from the secondary cutting lip that has been produced.

Selection of proper point configuration, plus accurate and effective web thinning, insures maximum performance from quality tools.

Extra copies of this article are available while supply lasts. Write Tooling & Production Magazine, 1975 Lee Rd., Cleveland 18.

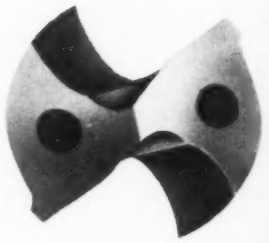


Fig. 8 Center notch thinned point.

Gun Drilling Machine Assembly Handles Jet Parts

Precision gun drilling of expensive jet engine housings is done on a semi-automatic six-station machine at the Lycoming Div. of Avco Corp. The bell-shaped magnesium alloy castings are progressively drilled on the 35-ft long machine assembly, designed and built by the Drillmation Co., Inc., Center Line, Mich.

Twenty holes with diameters from ⅛″ to ⅜″, each requiring a 20 rms finish, are gun drilled. Lengths vary from a minimum of 3″ to a maximum of 8″. Feeds vary from 0.0003 to 0.0007 ipr and speeds of 500 sfpm are used.

The base of the part is approx. 20″ across one end, tapering to 13″ at the opposite end. Its height is 19½″.

One of the difficult problems was location of holes, which had to be gun drilled lengthwise through the walls, intersecting and crossing other holes. The positive feed of the Boremation unit eliminated all surge, saving dollars in tool costs and downtime.

Three basic components are used in the six machines that make up the installation: an electrical control panel, a Coolmation high pressure, high velocity filtration system, and the Boremation hydraulic gun drilling power unit. Twenty power units are used in the complete machine, three to five units for each of the six segments. A motor and drive belt that can be rotated 180° on its axis allows mounting of the units at any angle.

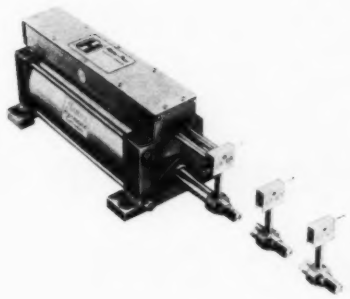


Fig. 1 A connecting link on one end of the two cam rods is attached to the mechanism the positioner is controlling. The other ends of the cam rods trip limit switches as the rods slide back and forth. Adjustment screws permit locating the limit switches anywhere within the travel limits of the rods.

Multiple Positioning Control

Most every industrial plant has uses for automatic positioning controls to improve product quality, increase safety and save time.

This new electrical mechanical servo device, is called the Hanna-Powr-Positioner, and automatically positions machine tool elements, valves, float levels, doors, hopper-gates and so on at any of the several predetermined positions, corresponding to a control selector switch signal.

The positioner, Figure 1, has two cam rods and a connecting link on one end is attached to the mechanism the positioner is controlling. The other two ends of the steel cam rods trip limit switches as the cam rods slide back and forth inside the two channel grooves in the extruded aluminum positioner housing.

There may be as many as 14 sets of limit switches/ft thus 14 different positioning stops/ft in the positioner. The positioner may be made in various lengths up to eight ft long as standard.

One of the limit switches in each pair is normally open, the other normally closed. The limit switches are not set exactly opposite one another in the housing. The interval between the contact points of each set of limit switches is called the "null" band, an important design feature.

The servo action takes place as the end of the positioner cam rod moves or hunts for the position requested by the position selector switch; it passes the various sets of switches until it trips one switch at the desired position setting. This servo action causes a solenoid valve on the power cylinder to move the cylinder in the opposite direction; thus the cam trips the other limit switch in the set, thus energizing the other solenoid of the valve to apply air or hydraulic energy to move the cylinder in the opposite direction. The cam rod then stops in the "null" band area between the set of switches, at the position requested by the positioner's control selector switch.

The location of the predetermined stop position stations can be easily changed by loosening two adjustment screws on the limit switches and moving the sets of limit switches.

This positioner can also be used with a two-directional motor in conjunction with a reversing relay to operate many different types of controls.

The extruded aluminum positioner housing is enclosed with a snap-on lid, fully gasketed, built to conform to NEMA Class IV and V watertight and dust-tight requirements. The housing has been especially treated to give it a hard electrical insulated coating.

A complete package, cam-rod type positioner with four sets of adjustable stop-position switches costs about one-third of what it costs to install eight individual comparable switches on a machine.

For further information, please write Hanna Engineering Works, Dept. PR-26, 1765 Elston Ave., Chicago 22, Ill., or Circle Inform-A-Gram No. D1.

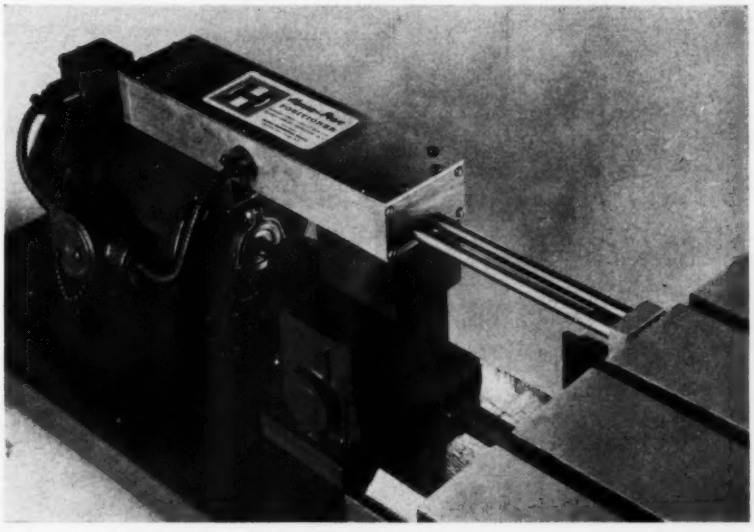


Fig. 2 By this type of setup the Hanna-Powr-Positioner is used to control a machine tool table. The positioner achieves accuracies of ±0.005", depending upon the mass and weight of load or type of application.

Getting The Most From A Taped Turret Drill

by Charles Weiner
Associate Editor

AN ENGINEER'S DREAM has become a reality at the Cleveland plant of the Harris-Seybold Div., Harris Intertype Corp. Five years ago, Chief Process Engineer William Newell had an idea for a layout drilling machine with capacity to handle a variety of large and small parts used in the giant printing presses the company makes. He even started to design such a unit, but gladly chucked his plans when the Avey Div. of Motch & Merryweather Co. told him they could build a machine that could be tape-controlled to meet his needs. The result was a six-spindle turret drill with a 100" table, directed by Warner & Swasey's Probomat 2-axis positioning control. It's now operating on two shifts at Harris-Seybold, handling more than 400 short run jobs without prior layout or expensive special tooling.

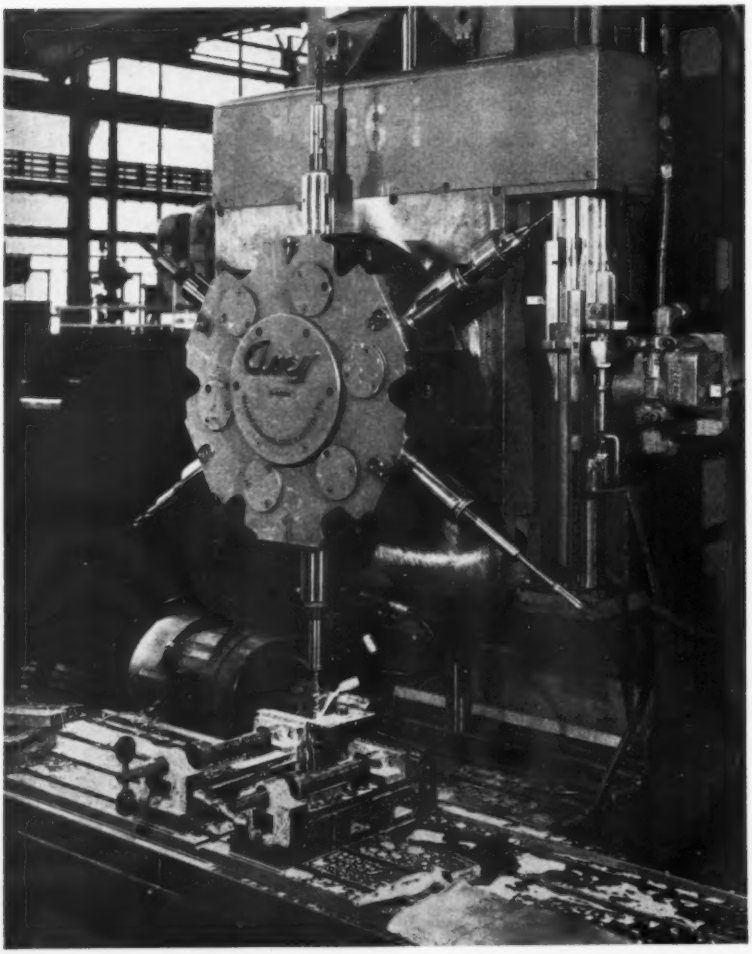


Fig. 1 Combinations of standard fixturing components are used for most jobs on this tape-controlled Avey turret drill at Harris-Seybold. Here, a flat rectangular part is drilled.

Once Mr. Newell's dream was translated into a highly synchronized assemblage of hardware, the problems really began. This was the shop's first numerically-controlled machine — a sophisticated and somewhat awesome piece of equipment. New techniques had to be developed to take advantage of its capabilities.

After six months of step-by-step familiarization with the taped turret drill, a system was devised for efficient use of the machine in the company's operations. Mr. Newell's simple and direct method of keeping jobs flowing on and off the machine involves all steps in the operation — from prints to punched tapes to production. Procedure is simplified by dividing

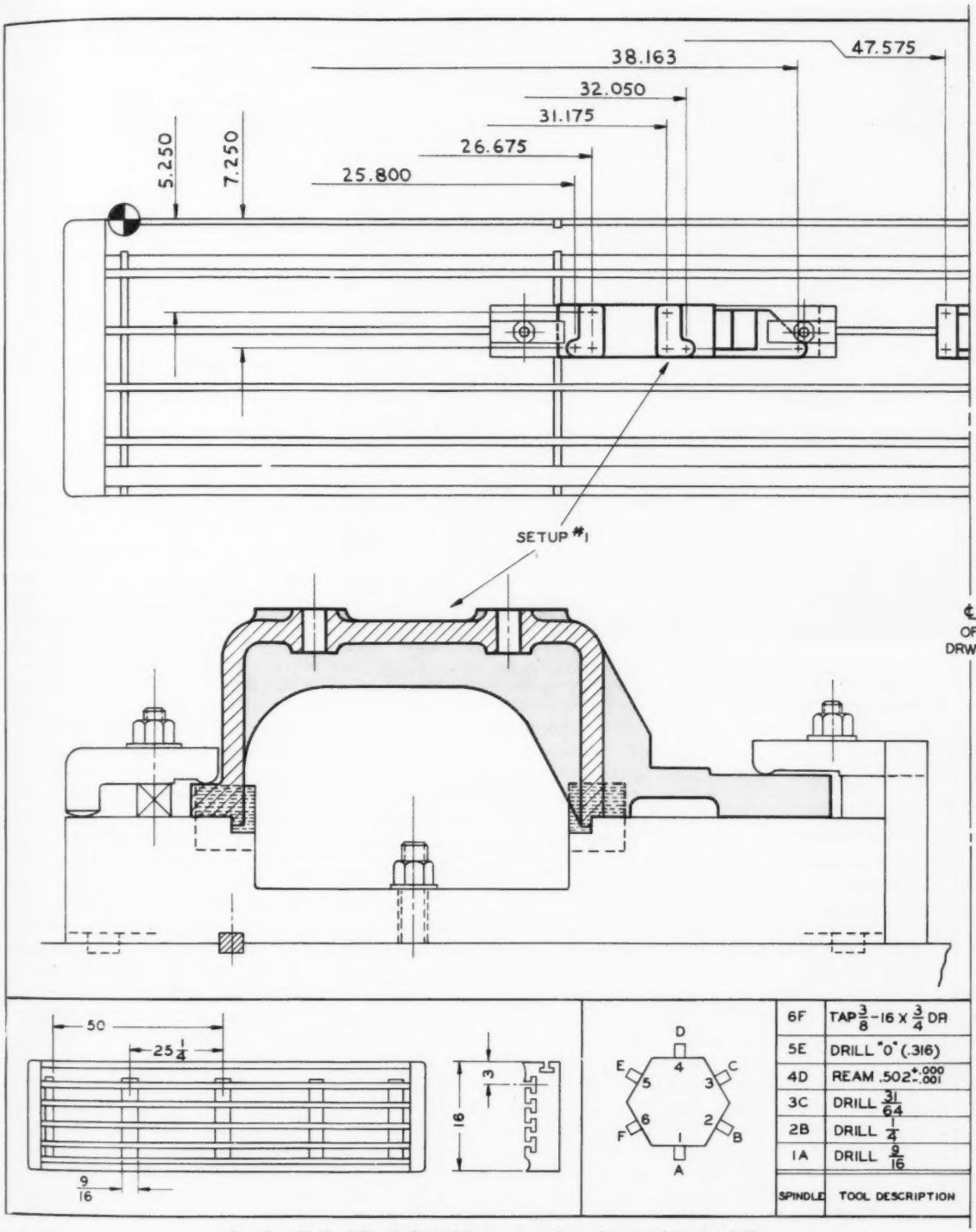


Fig. 2 Half of Harris-Seybold's program form for taped turret drill shows location of part on 100" worktable, and position of holes with respect to zero point at upper left corner of table. For this part, fixtures were keyed to the table. Eleven holes are numerically drilled, tapped and reamed; six from the top and five from the bottom of the part in two simultaneous setups. After two like parts are loaded on the table, one top-up and one bottom-up, machine cycle is started. Drilling and reaming are completed on the part on the left (setup 1). It is removed and another part loaded in its place, while work is done at the right hand position. This procedure is now repeated back and forth completely tape controlled.

Fig. 3 Chief Process Engineer William Newell checks tape which puts the drilling machine through its paces without the need for hand layout or special drill jigs.

the responsibility for the different steps.

Heart of the System

The main ingredient in the company's method is a special process form (Fig. 2) they devised. Figure 2 shows a top view of the Avey drill's 100″ table, and the part to be drilled. A front view of the part and fixture is drawn on the form, but their dimensions are not specified. On the section of the form showing the table, a top view of the part is drawn. Location of the part on the table and hole positions are specified by the tool design department. This is done by referring all distances to a fixed zero point at a corner of the table. The position of the holes along the length (X axis) and width (Y axis) of the table are written on the form as so many inches from the zero point. Tools to be used and the spindles to which they are assigned are also noted on the form by the tool design department.

The process form then goes to the standards department, where speeds and feeds and sequence of spindle operations are assigned. At this point, the information on hole position is taken from the form, and together with the data on spindle sequence, speeds and feeds, is punched into paper tape on a Flexowriter.

The methods department notes any change in procedures, and alters methods if necessary. A copy of the information punched into the tape is sent to the standards and tool design departments. Each group checks the information it supplied, making sure there are no typographical errors.

The tape is put in a metal can which is labeled with the part number and filed with the process form in the tool crib. When the job is called for, the operator merely picks up the tape, process form, and any special tools required. Setup is simply a matter of clamping the part on the table at the location specified on the sheet, putting the tools in the proper spindles, and loading the tape into the tape reader unit in the control cabinet.

When the start button is pressed, the tape takes over, directing X and Y motions of the table, turret indexing, speeds and feeds for drilling and tapping, coolant flow, and air blast for cast iron jobs. The operator stands by to clear chips, and to load and unload. After the job is run, the tape and process form are filed in the tool crib until the job is called for again. Most jobs are runs of 10 to 20 pcs, and are repeated several times a year.

Results are Rewarding

Harris-Seybold's system of divided responsibility for drilling by tape is working well, as evidenced by the practically continuous operation of the machine on both shifts. Each week new jobs are being added to the 400 already run on the machine. With the taped turret drill, the company is getting more accuracy than on parts previously laid out by hand. Although accuracies of thousandths are not regularly needed, the machine is capable of producing them.

Jigs are eliminated, and most of the 400 jobs are held with general purpose tooling. Various combinations of vises, parallels, and chucks are all that is ordinarily required. Parts for a special machine were run on the Avey Turret-Dex drill, eliminating $12,000 worth of special drill jigs that would have been required on a conventionally-controlled drilling machine.

The work surface of the machine's table is 12 x 100″, and table travel is 99.999″. A ball bearing mounted rapid advance and feed stroke control is conveniently located at the side of the turret head.

It took a while before Mr. Newell and his associates got the hang of numerical control, but their thinking and planning during the learning period has paid off in terms of efficient, accurate production at lower costs. Now that they've got their feet wet, they're studying other possible areas for numerical control. Tape control has won some hearty supporters at Harris-Seybold. end

Machine Replacement For The Shop Manager

by Baxter T. Fullerton

Mr. Fullerton is Director of Marketing Services, The Warner & Swasey Company, Cleveland, Ohio.

Chapter II - Seven Ground Rules To A Better Measure Of Machine Obsolescence

TODAY'S MACHINE TOOLS are more productive than machines of 10, 15 or 20 yrs ago. Some machines are so spectacularly more productive that we can hardly go wrong in measuring this increased productivity in machine replacement calculations. **"Paid For Itself In Two Years," "200% More Productive"** are the headlines we machine tool manufacturers like to find for our advertisements, but replacement formulas that "solve" these cases of obvious obsolescence don't really have very much to brag about. These were open and shut.

"Obsolescence" doesn't always mean that the new machine will turn out two pieces while the old one turned out one. Such major breakthroughs in machine tool designs don't come frequently. Design improvements are often little things that are difficult to express on a time-per-piece basis.

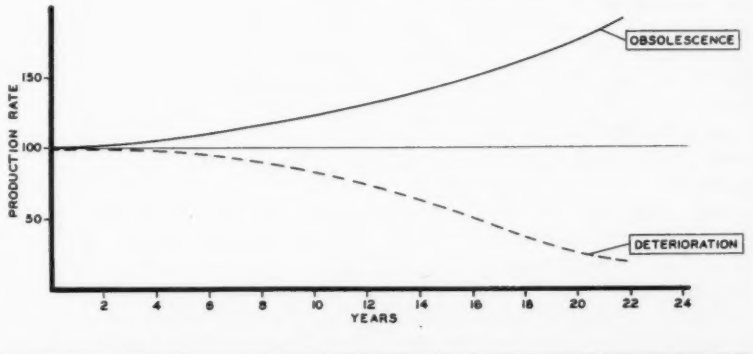
The success of any equipment replacement formula rests with its ability to come up with reasonably accurate answers on these non-spectacular cases. If it doesn't, good machine replacement opportunities are often lost. These are the cases at which we should take a new look to see if we're doing the right kind of measuring.

It's difficult to generalize on these matters. Each case demands measurement in view of its situation. It is possible, however, to state certain "ground rules" which can be helpful in any measurement of increased productivity. They should be especially helpful in those cases of moderate production advantages in which we have often been missing the mark in present replacement formula practice.

1) Spectacular Production Improvement Isn't Necessary

There are many machines in your shop today which should be replaced, even if there is little apparent production advantage to be gained from the modern design.

Fig. 1 As introduced in Chapter 1, this chart conveys the idea of both obsolescence and deterioration in the life of a theoretical machine tool.



Design-improvement-obsolescence is frequently far less than half the story.

The old machine you'd like to replace hasn't only become obsolete, it has been wearing out. To refresh your memory on this, Fig. 1 is a chart from Chapter 1 showing the effect of both obsolescence and deterioration in the life of a theoretical machine tool.

The shape of these curves will vary in every instance. Many times deterioration will be of substantial importance and obsolescence of very little importance.

As also stated in the first chapter, these two effects should be measured separately. Here, we are discussing the measurement of obsolescence only, and when we're measuring obsolescence it's helpful to remember that the weight of the world is not always on its shoulders. If the production improvement alone from the new machine is enough to justify its purchase, that's fine. If it isn't enough, we don't quit yet; deterioration has still to be measured.

2) Estimates of New Machine Production Have Limited Usefulness

The most widely accepted method to measure the higher productivity of new machine tool designs is to make production estimates showing the amount of production that can be obtained on the new machine, and to compare this with the production being obtained by the present machine or method. This may be an ideal way to compare two completely automatic processes, where the relative speed of human beings is not involved, but it is frequently an unsuccessful way to measure the production that can be obtained from hand operated machine tools. The trouble is that you're comparing what **is** being done by an old machine or method with what **should** be done by a new machine or method. These might be completely different.

Does your shop have an incentive system? Does it cover both setup time and production time? Are jobs preplanned? What kind of cutters are used, and how readily available are they to the operator? The answers to these questions will often have a great deal more to do with production than whether the job is on a 1940 or 1960 model machine. The real question is "What will a 1960 model machine produce under **your** shop conditions?" This is a relative question not easily answered by independently-arrived-at production estimates.

Brass shops are noted for higher productivity than most of us would think possible!

When Warner & Swasey first brought out its 16" electrocycle turret lathe, which is used primarily in brass shops, we made production estimates showing — we thought — the high productivity that these shops would obtain from this new machine. When these first estimates were presented, we often found that the customer was turning out up to twice that much production with his 30-year-old clunkers! Brass shops which usually pay piece work can turn out more pieces on a turret lathe than most of us would think possible! We found that we had to alter our estimates considerably to allow for the speed with which brass shops operate machines.

This problem of relative production frequently works in reverse. When we estimate the production that can be obtained on a new machine, and find that this is six to eight times the production the customer is obtaining on his old one, we would probably want to revise our figures to suit his operation. There shouldn't often be that much difference.

In some cases, especially when a completely new production method is involved in the replacement, a production estimate must be used. If so, make sure that you have made allowance for your own shop conditions. Even though your judgment won't be 100% accurate, it's better to try to make the proper allowance than to make no allowance at all.

3) Estimate the New Machine Advantage on a Comparative Basis

If production studies are not always the best way to measure increased production from new machines, how can it be measured? A comparison of machine features can be an acceptable way, especially for a general purpose machine tool handling a variety of work. Make a list of the significant new design features of the machine you are considering, and estimate the importance of each feature to you **in your work.**

Let's say the proposed new machine has double the top spindle speed of the one you want to replace. You know the nature of the work that will go across the machine. You know reasonably accurately what percentage of this work could use more speed — both now and in the foreseeable future — and you can estimate reasonably accurately how much increased production you'll get on these jobs. In a typical case you may judge that half of the work can use more spindle speed, and that your production will increase an average of 20% on that half. Your over-all production increase because of this feature will then be 10%. Similar reasoning would hold for each of the other new machine features.

Remember, you're measuring at this point only the design advantages (obsolescence) inherent in the new machine. The sum of these production advantages may not be more than a small percent. Deterioration on the old machine or machines will be measured later.

4) You Can't "Prove" All Your Savings

One of the greatest fallacies in the current use of replacement formulas is that savings can be "proved" and that if they are not proved, they should not be counted as savings. "Proved" savings, such as production estimates and studies, can often be horribly wrong. These studies have to be used with judgment to have any validity at all. If judgment is used in one instance, there is every reason to use it as required at any other place in the calculation. We must accept the fact that many of these matters are not susceptible to **proof** either before or after a new machine is purchased.

Proof is often required for the vague reason of keeping operating people "honest" in their equipment requirements. However, if the shopman's judgment is sought and used, there is no reason for this judgment to be biased.

Many sophisticates in the use of formulas have told me they can "prove" anything they want to in order to make the formula come out with the answer they think is best for their company. Proving doesn't guard against fudging the estimate; it invites it.

Some say that if a value can't be proven, it shouldn't be included in the calculation. This is to say, in effect, that the best guess for a value that is hard to estimate is "zero." If there is any value at all, zero is **not** the best guess. Your answers can never be completely accurate anyway, so you might as well make the best guess you can for any value that is significant.

The load chart. Why waste your time and money on something that you know is going to be wrong from the minute you start using it?

5) Use Load Charts With Discretion

Too many replacement analyses are worked out entirely too tediously, with no resulting gain in accuracy, through the use of a detailed load chart showing how many hours per year the new machine will be kept busy. If it's a special purpose machine that will be used on few jobs, the load chart, as inexact as it might be, is probably a necessity. But for the machine tool that will be used on a high variety of jobs, and will take work from several present machines, the load chart is often unnecessary.

The load chart may have dozens of jobs on it. It is usually based on last year's production. The only thing we know about **next** year's production is that it will be different. Furthermore, if the proposed new machine is a general purpose machine, it will be used in your shop 5 to 10 yrs from now. Some of the pieces you are so carefully putting into a load chart today will not even be produced 10 yrs from now.

If you've struggled through junior high homework recently, you'll agree that percentages can be tricky!

Once again, and particularly for the general purpose machine, an estimate is required. How many machines are now doing work that the new machine can or will handle? What percentage of the time are they on this type of work? How much faster will a new machine

You might find it helpful to use the following exact calculation every time. You'll know then that you're always translating the hourly savings correctly.

	Example: for a new machine that will be 25% more productive:
1) Add the estimated percentage production increase to 1.	**1) 25% plus 1 equals 1.25**
2) Put down the number of annual hours at normal shop load the new machine will operate? _____ hours.	**2) New machine will operate 4000 (2 shift) hrs**
3) Multiply (1) by (2) to get equivalent hours on old machine(s). _____hours.	**3) 4000 x 1.25 equals 5000 hrs**
4) Subtract "new" hours from "old" hours, (2) from (3), to get annual hourly savings. _____ hours.	**4) 4000 from 5000 equals 1000 hrs saving**

be on this work? From questions like these comes the real answer as to how busy the new machine will be.

Let's face it. The load chart is usually window dressing to "prove" that you have enough work for the new machine. An intelligent and thoughtful estimate will give you a much better answer than a chart will. You may want to scribble down a few figures in arriving at your estimates, but don't waste your time and money on something that you know is going to be wrong from the minute you start using it.

6) Beware! Percentages Are Tricky

Once you have figured out how much more productive the new machine will be, and have arrived at a decent estimate of the number of hours per year it will run, you have to translate this into a total number of direct hours saved. This sounds simple, but I've seen a good number of replacement calculations incorrect by a considerable amount because of faulty seventh grade arithmetic. If you've struggled through junior high homework recently, you'll agree that percentages can be tricky.

Specialized machines, working on a few pieces, are not much of a problem. There is a certain amount of work to do. It has been taking a certain number of hours to do this work by an older machine or method, and will take a certain number of hours by the new method.

General purpose machines, however, which often take work from several old machines, are more of a problem. It is not enough to say that it will take the new machine three-quarters as long to do the work, and that therefore it will do 2000 one-shift hrs of work in 1500 hrs and save 500 hrs/yr.

If the new machine is to be busy, you must find the number of hours it is **replacing** with its 2000 hrs per shift/yr. In the example just given, 2000 hrs of work on the new machine will actually replace 2667 "old" hrs. The per shift savings is 667 hrs/yr not 500.

7) Show Significant Savings Only

The theorists on equipment replacement are correct in saying that all possible savings from purchasing the new machine should be shown in calculations. As pointed out in Chapter I, however, if we dig too deep for insignificant savings, it will add more time to the calculation than it is worth, and it will delude us into thinking our calculations are completely accurate. Supplementary savings should be shown, but we're not trying to measure what we might save in wiping cloths!

If a new method eliminates prior or subsequent operations other than the main one we're considering, these savings should be shown. Direct operational costs are involved, but so, for instance, are in-plant handling costs. You can't conduct a study of your transportation problems for every individual machine replacement analysis, but you might come up with some averages that could be helpful.

A significant savings in the number of operations can also cut down substantially on manufacturing leadtime so that there will be less inventory required. If possible, arrive at some decent rules of thumb in these matters in consultation with your financial and accounting people. With the advent of numerical control, savings in leadtime and inventory become matters of large concern in some shops, and it is necessary to find some simple way to express these in dollars.

Your management is relying on your judgment from the minute you start to work out a calculation. They have everything to gain and nothing to lose by relying on it all the way!

Your Own Judgment Is What Counts!

Don't show significant savings such as these as merely "supplementary savings" without putting some kind of a value on them. If you don't put a value on them while you're making the calculation, either their value will be ignored, or someone will use a mistaken value based on their judgment instead of yours.

The place to use judgment in showing the prospective savings from equipment replacement is in the shop where the operations take place. If your company is going to use machine replacement formulas, shop operating people should insist on the right to express their judgments on the savings to be obtained from replacement. Whether it knows it or not, your management is relying on your judgment from the minute you start to work out a calculation. They have everything to gain and nothing to lose by relying on it all the way.

If we all understand this, replacement calculations need not be the road blocks they've so often been considered. end

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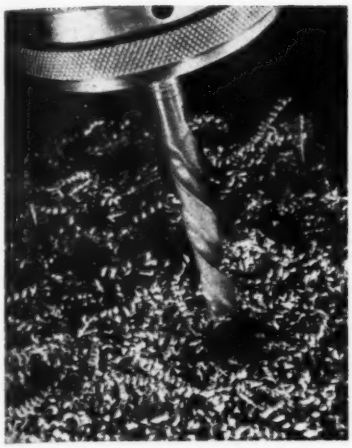
Magnesium in Automobiles

"By 1965 magnesium use will exceed 10 lbs per automobile," said Robert Pittsley, magnesium sales manager of Dow Chemical Co.'s Detroit operations, at a recent press conference.

Magnesium, lightest engineering metal next to beryllium, stood the test of fire in the crankcase and transmission of the rear-engine Volkswagen. Now the metal is to be put to similar use in American vehicles. Major automotive manufacturers are currently evaluating, or producing magnesium parts. Volume use is foreseen in die castings, automotive engines, transmissions and structural interiors.

The Cover:



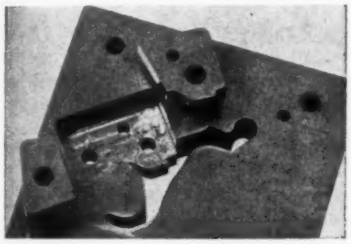
Emphasis . . . DRILLING!

Chips really pile up when 100 holes are rough drilled to a depth of 3½" in a bottom plate for Zagar Inc.'s 100-spindle gearless drill head. A Cleveland Twist Drill ¾" HSS drill was used without coolant on the free cutting machine steel workpiece at a speed of 180 rpm and feed of 0.009 ipr.

Photo courtesy The Cleveland Twist Drill Co

Machining of Hard Materials

Existing long-run stamping dies were modified, without an annealing operation, at P. & F. Corbin, Div. American Hardware Corp. Deformation of critical tolerances which could result from annealing was prevented through the use of Mill-All carbide tools.



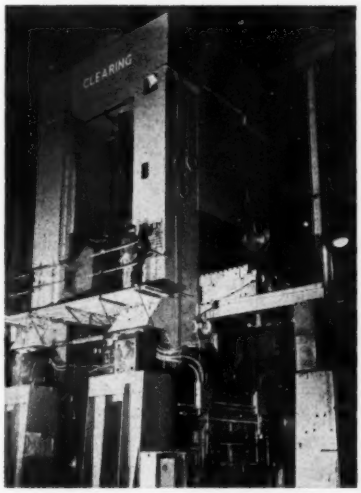
The dies were D2 steel hardened to 61R_c, and new tooling was a major consideration. Proper carbide grade and correct tool design for maximum cutting efficiency, long life, repetitive accuracy, and easy sharpening were all of critical importance. The standard Mill-All tools used in the product change — which involved the component parts of a lock set manufactured by P. & F. Corbin — brought about happy results.

Write the Mill-All Co., 150 Marion Ave., Plantsville, Conn., about standard-sized carbide drills, end mills, boring bars, counterbores, and countersinks for machining hard materials.

U.S. Made Press for Japan

A huge 650,000 lb Clearing press now makes its home at Yokohama, Japan. The press, along with four other single action machines, was designed to specifications by Isuzu Motors Co., Ltd. The press will serve in the production of diesel trucks, buses, and Hillman-Minx automobiles.

Fully enclosed, the press is of all welded steel with double action bottom drive, moving bolster, and dual speed clutch. With unobstructed die space it measures 84 x 108". The pneumatic flywheel brake is solenoid operated and counterbalance cylinders for inner and outer slides are complete with tanks and fittings. Another plus for the machine is the mechanical stroke position indicator located at convenient eye level. One set of hydraulically actuated mechanical clamps for inner and outer slides was furnished with full limit



switch protection, to prevent slide operation when clamps are not in proper position.

Write Clearing Div., U.S. Industries, Inc., 6499 W. 65th St., Chicago 38, Ill. Write for complete specifications, or circle Inform-A-Gram No. D3.

Improved Crankshaft Finishes

New paper-backed coated abrasive rolls are taking the place of cloth rolls in 1961. Credited with better performance in rms readings and with lower cost, based on sustained testing the 50 yd rolls were developed by Behr-Manning Co., Troy, N.Y. An impregnated backing adds tensile strength, pliability, and resists tearing. Sizing on the backing allows operation without slippage in oil. For more information circle Inform-A-Gram No. D4.

Design Clinic

Frictional Jig Clamp

In a constantly changing, economy-minded industry many tool designs never get off the drawing boards. If they're untried their merits and faults remain hidden. Here's an idea proposed by a tool designer who's been unable to "sell" it to company management. What do you think? Are they missing a good bet or not? We've kicked it around a bit and you're invited to do the same.

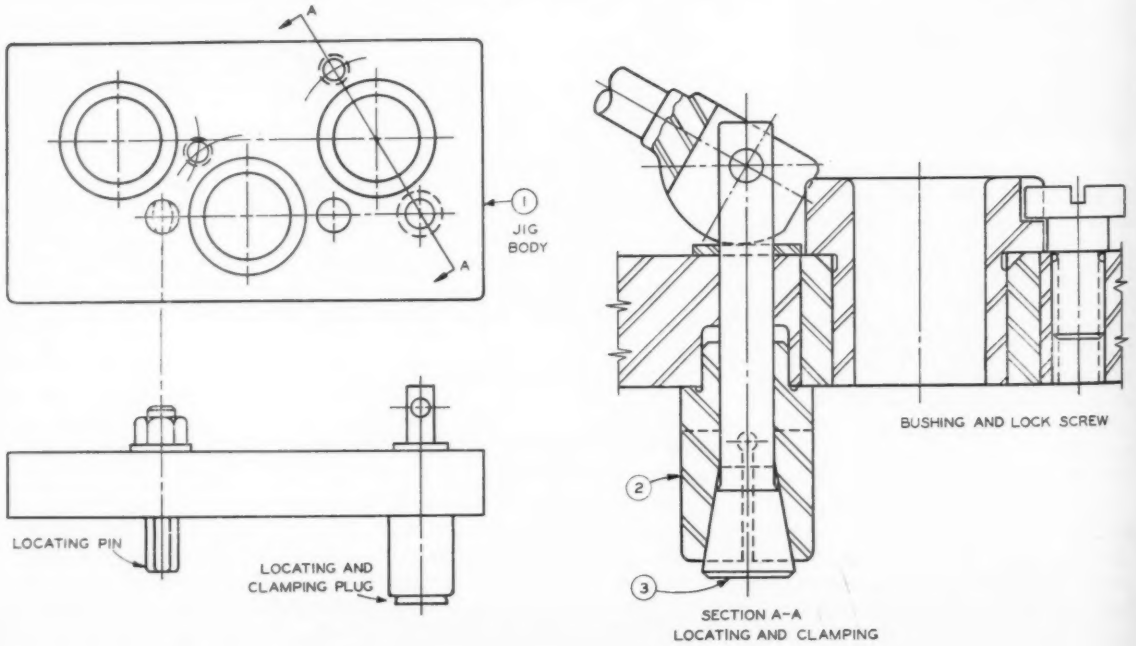
HERE'S AN UNTRIED, LOW-COST TOOLING PROPOSAL for producing a number of equally spaced holes to reasonably close tolerances. It's for hole patterns on large, flat surfaces where clamping the tool is difficult.

To be specific let's consider heat transfer tube sheets: In this work, many accurately machined holes are produced in a regular pattern. The pattern may be square pitched or, as more frequently used, triangular pitched. Holes may be made by drilling and reaming, or by a single finishing operation using a spade or gun drill. Spacing must be accurate to maintain the "ligament" or proper wall thickness between holes. On certain jobs ligaments are held to close tolerances.

Today, automatic tape controlled machines for deep hole drilling can handle this operation with ease. The question is: Can a plant with this type of work afford this equipment?

Bar type jigs are sometimes used, drilling a full row of holes at a time. However, certain difficulties are encountered with this tooling. Bar jigs must be the length of the longest row of holes. Also, where close hole spacing is required standard drill bushings cannot be located close enough without interference, so the bar must be made of hardened tool steel. This is expensive construction.

Fig. 1 Locating-clamping plug, detail 2, in the body of frictional clamp jig, detail 1, is expanded by action of the tapered end of the clamping mandrel, detail 3.



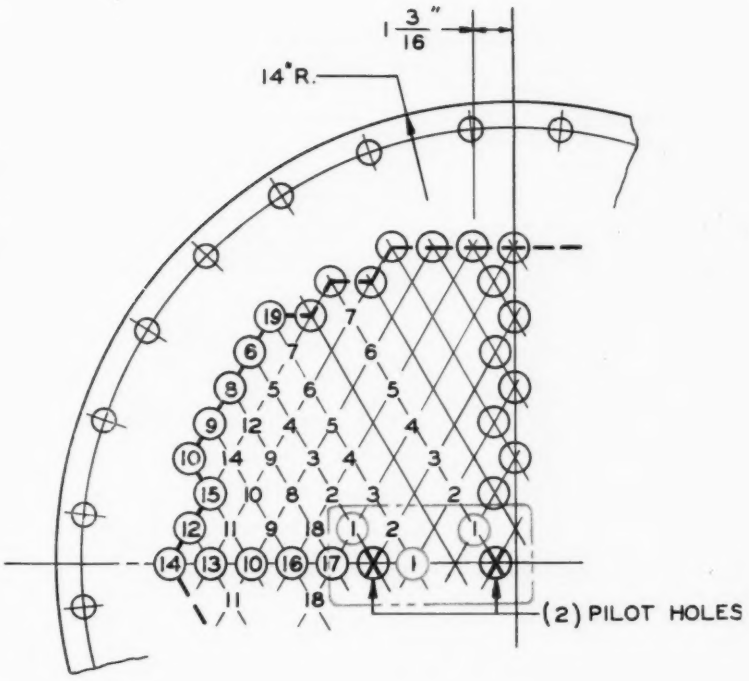


Fig. 2 Typical segmented tube sheet hole pattern. Jig is initially located in two pilot holes and three holes are drilled and reamed. Two of the drilled holes are then used for locating the jig and the next group of holes is drilled and reamed. Jig is relocated in newly drilled holes until pattern is completed.

A unique tool is proposed; it features a friction-type combination clamping and locating plug. Four estimates for this construction average $230. See Figure 1 for construction details.

Construction of Jig

This particular jig is for a pattern of 0.750″ dia holes with a 1″ triangular pitch. A hardened tool steel locating-clamping pin is press-fitted in the hole of the jig body (Sect. A-A). Appropriately sized for locating purposes, it is expanded and tightened by the action of the clamping mandrel.

The mandrel's tapered end provides adequate expansion for gripping in a previously reamed hole. Also, the tangent of the taper angle is greater than the coefficient of friction for steel against steel (unlubricated). This prevents "freezing" of the tool's mating parts during clamping.

The mandrel is actuated by a standard locking cam. The cam rides on a hardened steel washer.

At a second hole is a diamond locating pin of hardened tool steel. This pin can also be located in a secondary hole immediately to the right of the clamp. It is used in this location only if it is necessary to complete holes at the outer limits of a particular pattern, locating on adjacent reamed holes.

Standard liners and slip renewable bushings are used at each of the three hole locations. Lock screws are used. Because of the proximity of bushings and other jig parts, it may be necessary to grind bushing heads to provide clearance with other components.

Drilling Sequence

Using this type of jig, holes are drilled and reamed in a sequence as indicated in the suggested plan shown in Figure 2. This represents a typical tube sheet hole pattern for a heat exchanger. Before the jig can be used, however, it is necessary to accurately locate and ream an initial pair of holes (indicated at "X"). Since all other holes may be considered indirectly located from this pair, it is preferable that the initial holes be in the approximate center of the tube sheet.

These holes are preferably done on a jig borer, but another method would be from the jig itself, with both locating members removed.

When the starting holes are in and reamed, the balance of the holes are located from this jig. At the outset, three holes can be picked up at each setup. As the pattern nears completion, only one or two holes will be drilled at each setup. For example, hole #19 is located and drilled alone, piloting from holes produced in the #3 and #6 setups.

In each case, holes must be reamed after drilling to furnish the degree of accuracy required for following setups. Besides initial location of starting holes, extremities of the hole pattern must be indicated. Naturally, no holes should be located beyond these limits.

Jigs of this type could be used in other applications. For example, drilling a series of holes around a pair of existing holes in a large area. Here again, frictional clamping could readily solve an otherwise complex tool holding problem. In some instances, shifting the jig to complete a hole pattern may not be required; one setup could suffice.

Editor's Remarks . . .

Hardly a tool is designed but what it could have been done better in some way — either by someone else or perhaps by the original designer.

First off, I think the whole concept is wrong; most manufacturers involved with tube sheet are "so involved" they can afford some

type of programmed equipment, however elementary. In this day of bid and quote on nearly every job, a job shop wouldn't seem to have a chance of getting a job like this if they bid according to time required; and a manufacturer couldn't afford to do it himself unless he had automatic equipment.

Of course there are at times circumstances that cause deviation from the ideal manufacturing approach. For instance, it could be that a plate was too large to "ship out" for this operation. Or, perhaps the only handy source for a hole job was booked solid with their jig borer. Or perhaps your own jig borer was "down" — or improvising on your radial was out because of its load. Could you, if you had to, do a good job with this suggested design? Probably so if accumulated tolerances didn't "eat up" your ligaments somewhere in the pattern.

The quadrant shown in Fig. 2 is taken from an actual tube sheet drawing with the following specifications: Drill, ream and chamfer 268 holes. Hole pattern is to be symmetric about centerlines. We suspect the locational tolerance of the hole would be within a 0.005R of true position.

To us it looks like this might be a last resort approach — at least for the job in Figure 2. What do you think? We would like to hear from you.

WEH

World Adopts New Standard Of Length

A few months ago, the world adopted a new international standard of length — a wavelength of light — replacing the meter bar which has served as the standard for over seventy years. The announcement was made from Paris by Dr. Allen V. Astin, Director of the National Bureau of Standards, U. S. Department of Commerce. The action was taken by the 11th General Conference on Weights and Measures, which is meeting in Paris this week.

Dr. Astin is heading the American delegation to the Conference which includes Louis Polk, President, Sheffield Corporation; Elmer Hutchisson, Director, American Institute of Physics; A. G. McNish, Chief, Metrology Division, National Bureau of Standards; T. H. Osgood, U.S. Scientific Attache, London, and Martin Van Heuven and Benjamin Bock, of the U.S. State Department.

The new definition of the meter as 1,650,763.73 wavelengths of the orange-red line of krypton-86 will replace the platinum-iridium meter bar which has been kept at Paris as an international standard for length since 1889 under the Treaty of the Meter.

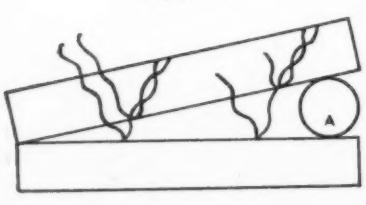
This new definition of the meter will not materially change the measurement of length nor in any way the relation between the English and Metric units. The wavelength standard and the metal standard are in satisfactory agreement. The inch now becomes equal to 41,929.399 wavelengths of the krypton light.

The interferometer is the device used to measure the meter by means of light waves. Krypton-86, the source of the new standard of length, emits an orange-colored light having 1,650,763.73 wavelengths to the meter. By means of optical instrumentation, this light is "laid" alongside the meter bar that has already been mechanically determined to an accuracy of less than one wave-length. Using an interferometer, one can then measure down to the fractional part of a wavelength by which the bar differs from the standard meter defined by krypton-86.

An example of a simple interferometer is made with two optical flats — disks of glass or quartz whose facing surfaces are planar. These are positioned one on top of the other, making contact at one edge and separated at some other point by the object to be measured. Single-color (monochromatic) light is directed at the upper surface, and each ray is divided into two portions. One portion is reflected by the lower surface of the upper flat, and the other passes through to be reflected from the upper surface of the second flat. These rays are combined in the upper flat, and form alternate dark and bright bands. Each dark band or fringe of this pattern represents a separation of the two flats by an even number of half wavelengths. By counting the number of fringes between the edge and the point of contact with the sample, the height can be calculated. This is done by multiplying the wavelength of the light used by one-half the number of dark bands.

As an example, Figure 1 gives a side view of two flats being used to determine the height of object A. At those points where the reflected rays are out of phase by ½ a wavelength dark bands appear in the upper flat, Figure 2 is a top view of the device, showing that 10-fringes appear between the two points of contact. If Kr-86 light is used, the height of the object is: 10/2 x 0.0000238 = 0.000119".

Figure 1



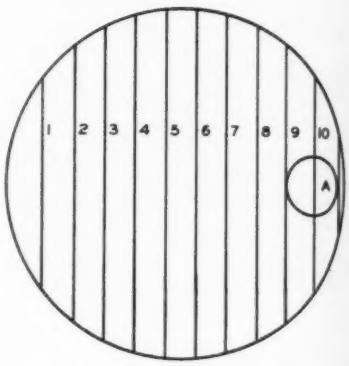


Figure 2

Spade drill retracts from 3½" dia hole drilled in one pass in Hy-Ten B3X steel bar for an injection molding machine.

The Economies of Spade Drilling

by Lawrence J. Curran
Assistant Editor

WE GET BETTER TOOL LIFE, at less cost, and do the job faster than we could with a twist drill, say Charley Behm, machine shop foreman, Al Moll, plant superintendent and Dick Sikorski, industrial engineer at Lester Engineering Co., Cleveland.

They're talking about the horizontal spade-drilling the shop does on the cast steel frames of Lester die-casting and injection molding machines. They're also looking for other large diameter hole jobs where the economies of spade-drilling might make its adoption attractive to the firm.

The bosses, as they call them, in the tough, high alloy, high carbon steel frames accommodate pins that allow the machine's linkage mechanism to swing into position and secure a die under hundreds of tons of locking pressure. The holes are drilled about 6¼" through the cast steel rated at about R_C20 to R_C25.

Each frame has six bosses, and the 2⅝" dia spade drill tip will drill all six before it needs to be resharpened. It takes an average of 15 min/boss. With about ½" of usable cutting length, the HSS insert tips can be reground several times before they're discarded.

They like the spade drill primarily because they don't have to pay for a lot of premium-grade but non-usable flute length, as they did when they used twist drills for this job. The straight-shank spade drill tip mounts in a patented holder bar, and is pulled securely into the bar by a set-screw. Both the spade drill holder and tips Lester

Operator Ed Ceaser checks alignment in a spade drill hole in lathe setup. Coolant is fed to tip through the holder bar by hose at left.

uses are made by Waukesha Tool Co., Waukesha, Wis.

The holder bar is made of ordinary carbon steel. It never comes in contact with the workpiece during drilling, and will last indefinitely, which is what Moll likes about the approach.

He's found it has other advantages, too. He can machine a big diameter boss in one pass with a spade drill. With the twist drills he formerly used, his operators had to back the tool out of the hole to clear the flutes of collected chips. A high pressure coolant, pumped to the spade drill tip through two passages in the holder bar, keeps chips flushing smoothly back out along the two grooves in the bar. Three serrations on each face of the arrowhead-shaped spade drill tip break the chips into about ½″ lengths.

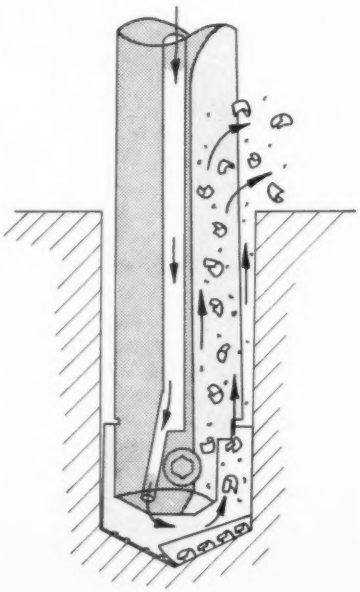
They run this job, using a 2⅝″ drill tip, at between 59 and 60 rpm, on a 50-hp, 4″ horizontal boring, milling and drilling machine. Feeds range up to 0.018 ipr once the hole begins to develop and the entire drill point is cutting.

Two in-line bosses at the casting's top are drilled through in one setup, meaning that the drill tip at completion is about 14″ away from its starting point. Then the casting is turned around, and the final boss is drilled from the other side. An in-line boring operation follows the spade-drilling, resulting in a tolerance of 0.001″ between the hole's center and the die casting machine's center line.

Behm says that there's no "wobble" problem with this insert method. The drill insert is precision ground, as is its mating surface in the holder bar. The setscrew holds the tip tightly in the bar.

They're spade-drilling even bigger diameter, and greater depth, holes on turret lathes across the street from Behm's operation. This is at Lester's plant No. 2, where Warren Annen is shop foreman. He can show a range of holes from 3 to 5½″ dia, and up to about 30½″ deep, that they've spade-drilled in AISI 4140 steel piston rods for the firm's machines. Annen says a spade drill holds better size than a twist drill on big holes. They start the hole with a center drill, and introduce the spade drill at low speeds until the entire tip is cutting. Then they boost the speed to 30 rpm for a 5″ dia hole, and to between 40 and 55 rpm on a 3″ dia hole. Maximum feed for the larger hole is 0.004 ipr, while the 3″ dia hole feed rate is 0.006 ipr.

Schematic of a spade drilling application emphasizes coolant action in flushing chips.



Their confidence in a spade drill's ability to hold size is evidenced by the fact that holes are drilled alternately from both ends of the piston rod, meeting in the center of a 20″ length.

The 30½″ hole is a blind one done in a larger rod. All these holes are bored ⅛″ larger than they've been drilled, and a taper is machined in one end.

They haven't compared spade drill and twist drill costs hole-per-hole at Lester, but they know that they're paying about $65 for a 2 to 3″ dia spade drill tip and holder. A similar-sized twist drill might cost around $150. Additional savings accrue because one spade-drill holder bar can hold a number of different diameter tips, and because the tips will withstand more regrinds than those on large diameter twist drills.

Extra copies of this article are available while supply lasts. Write Tooling & Production Magazine, 1975 Lee Rd., Cleveland 18.

Official photograph U.S. Navy

PR CRUISE

Logged by Jerry J. Miller
Huebner Publications, Inc.
Port of Cleveland

Recently, I had the good fortune to be invited by the Secretary of the Navy to sail aboard the aircraft carrier USS Forrestal for a five-day cruise. I was one of a group of six civilians from various parts of the country who received such an invitation. Other groups are being accorded the same fine, courteous treatment.

Why we were invited was never spelled out, but I'm certain it was to demonstrate to average taxpayers just why we need a Navy, and that the Navy is right on the ball and doing its job. As far as I'm concerned they accomplished their purpose magnificently.

We were flown out from Norfolk Naval Air Station clad in crash helmets and Mae Wests, chutes, etc., and landed on the deck; quite an experience in itself. From the air you have the feeling you're going to try landing on a door mat. After touching down, you get the impression you're whipping along in Rockefeller Center.

Lt. John Hicks was assigned to us as guide. This showed the good sense of the Navy, because a landlubber could disappear on this seagoing LaGuardia and not be seen again for a month. He got us up in the morning and put us to bed at night, and in the interim he did his very best to show us everything and explain everything on board. Needless to say, this was no easy task for him, considering the ground to be covered in that brief period of time.

This is quite a ship.

The Forrestal is 1039′ long and 252′ wide at its widest point. Its depth is 97′ at the center line of the flight deck. Its displacement when loaded is a mere 78,000 tons, and to build it required only 52,000 tons of structural steel. Running through it are 180 miles of piping and 260 miles of electrical cable. The flight deck covers approximately 4½ acres.

Apparently the Navy wanted us to see it all, and didn't allow any time for lounging or afternoon siestas. We rolled out before breakfast and went at a full gallop until they tucked away all the planes late at night.

There are approximately 4000 men on board the Forrestal, and I can't believe that all of them had on their Sunday manners just because six civilians popped in on them. All those we encountered personally, both officers and enlisted men, were so courteous and anxious to have us see what they were doing that we couldn't help but be impressed. If there's any complaint to make, it's that I'm not smart enough to understand but a small percentage of the tremendous mass of equipment that was demonstrated. It's comforting to know that the young guys working with it do understand, and that they're damned proud of the job they're doing! end

Chip Wringer Rings Up Savings

Many plants are realizing big savings in coolant and cutting oil costs by reclaiming these valuable liquids from metal chips with the chip wringer shown here.

Even after long periods of draining in a settling tank, metal chips or turnings still contain as much as 2½ to 3 gal of cutting oil/100 lbs. By running these chips for not more than 3 min in the chip wringer, at least 90%, and as much as 99%, of the valuable cutting oil remaining in the chips is removed.

This means that the wringer reclaims as much as 2.94 gal additional cutting oil from every 100 lbs of metal chips.

Time savings is another important advantage. In not more than 3 min, it reclaims again as much oil from every 100 lbs of chips as can be reclaimed in from 12 to 24 hrs with a settling tank.

Among its features are easy, safe operation, a dynamically balanced basket, self-balancing spindle with automatic oiling, and self-locking, spring-cushioned brake with electrical interlock.

Quality Control Clinic

Twenty technical papers, covering all phases of quality control and industrial statistics, will be presented at the University of Rochester, Rochester, N.Y., on March 28, 1961. The occasion is the 17th annual quality control clinic of the Rochester section of the American Society for Quality Control.

Drilling and Tapping Output Up 400%

BY INGENIOUS USE of a turret drill to drill and tap aluminum heat exchanger parts, Meridian Metalcraft of Whittier, Calif., reduced machining time from 30 to 6 min, effected a 40% reduction in tooling cost, and attained setup simplification — when compared to a former method employing a single spindle press with jigs and bushings.

The turret drill is mounted on a salvaged riveter C-frame. This unique setup provides a 45″ throat depth from spindle centerline, and a table-to-spindle nose range of 24″ max.

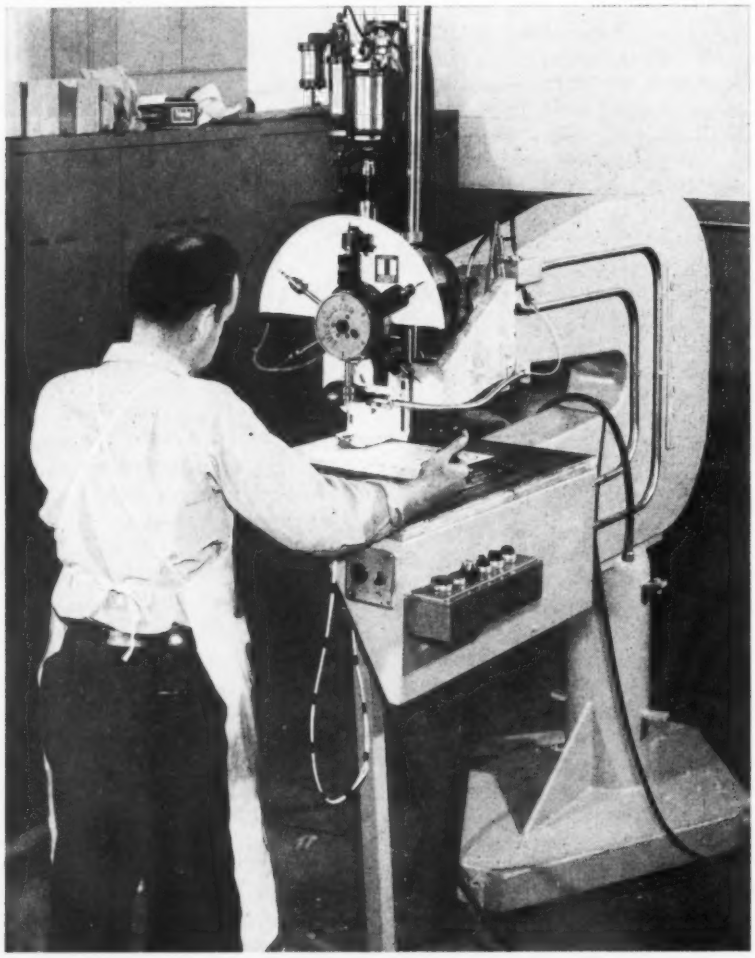


Fig. 1 Mounting this Burgmaster bench model automatic turret drill on an old riveter C-frame provides 45″ throat depth for a variety of jobs. The job described here involves drilling and tapping 60 holes of three diameters. The program requires six templates; three for drilling and three for tapping. The sequence paths on the templates are in colors corresponding to the color-coded tool spindles.

The heat exchangers' parts are produced in lots averaging 25. The hole patterns vary with different designs, with a ±0.002 tolerance specified on hole centers. A typical part has 60 holes drilled and tapped in three different diameters, requiring the use of all six spindles on the turret.

An ingenious fixture locator permits rapid, accurate location of each hole with minimum effort by the operator. An air-operated shot pin is built into the table and aligned with the spindle center. The workholding fixture has bushings in the bottom conforming to the required hole pattern. After the work is loaded into the fixture, a template is placed on top to show the operator the location of each hole.

The fixture is shifted to approximate location, and a hand-held control button squeezed. This plunges the shot pin into the bushing, aligning and locking the fixture into exact position for drilling. This also initiates the power cycle of the spindle: rapid traverse down, drill at pre-selected speed, feed, and depth of cut, and rapid traverse up.

For tapping, the return stroke is set to properly extract the tap from the hole. The Tapmatic tappers are reversible, and full floating. When either drilling or tapping, a control interlock prevents activation of the spindle feed if the shot pin is not fully seated in the fixture.

The six spindle tools are color coded to correspond to color paths painted on the fixture template, indicating the series of holes to be machined while the required spindle is in working position.

Thus, spindle #1 (red) is used

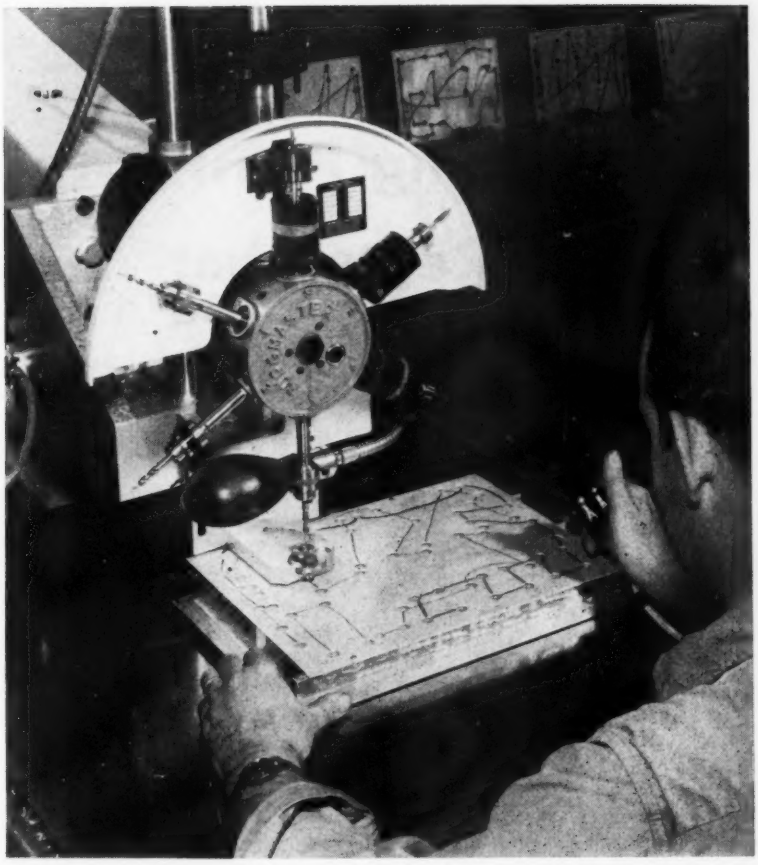


Fig. 2 The operator shifts the fixture to approximate position using the top template as a guide, and presses the control button to raise the shot pin. After the shot pin has brought the fixture into exact position, the spindle cycle automatically starts. In the background are templates for the five other drilling and tapping sequences.

to drill all holes for the 4-40 tap, and the operator hand shifts the fixture from hole to hole, following the red path on the template so that no holes are missed.

The Burgmaster "Automatic" bench model six spindle turret drill was recently introduced by the Burgmaster Corporation, and the design lends itself to economical tooling and fast production setups like the installation at Meridian Metalcraft. The standard machine controls permit three modes of operation:

Manual — Single spindle operation with power feed.

Semi-automatic — Turret cycles through predetermined sequence of operation, including skip index of idle stations. Stops for manual unload and load.

Fully automatic — Machine cycles automatically with interlocking controls synchronized to turret index, power feed, shuttle tables, index tables, or hopper feeds.

The cutting speed and depth of cut for each spindle is pre-selective, and during the feed stroke, three sets of adjustable cams allow each turret station to signal all automatic functions. One row of cams is employed to control down feed, skip index, or stop for unloading or any other purpose. The other two sets of cams may be used to signal any other auxiliary function for fully automatic operation, such as shuttle tables, coolant devices, air blasts, or hopper feeds.

SEQUENCE OF OPERATIONS

Spindle Number	Spindle Color Code	Tool	Speed
1	Red	Drill for 4-40 tap	1700
2	Black	Drill for 8-30 tap	1700
3	Green	Drill for 10-32 tap	1700
4	Red	Tap 4-40	900
5	Black	Tap 8-30	900
6	Green	Tap 10-32	900

Extra copies of this article are available while supply lasts. Write Tooling & Production Magazine, 1975 Lee Rd., Cleveland 18.

In an informal discussion of these "drilling points" with R-O Manufacturing Company's president, Bill Johnson, we tapped an outstanding source of practical manufacturing know-how. Where the text refers to "we" and "our" you can rest assured that his findings are predicated on years of successful tool design, construction and application. His is the voice of experience. E.W.P.

Drilling Points To Remember ⋮ And Use

by W. A. Johnson, President
R-O Manufacturing Company
Madison Heights, Michigan
as told to
E. Willard Pennington, Editorial Director

Multi-diameter Drills

This is a field that is only partly explored by most manufacturing engineering. Principally, the difficulty has been the resharpening after original manufacture. Many of these tools are made by hand. This doesn't allow the best of performance and the greatest amount of strength.

On the plus side is the fact that multi-diameter drills allow a single pass per hole. They also simplify and minimize inspection since you can check one or two diameters, and one or two depths, and be assured that the rest are accurate.

When running on multiple spindle automatics, a multi-diameter drill may be used in the last position before cut-off, thereby sizing everything exactly. This compensates for the mis-index common in some older machines.

The performance of these tools is usually as good or better than individual tools, since the larger diameters merely have to open up holes already produced. This reduces spindle end pressure.

Drilling and Countersinking

Tapping is improved when drilling and countersinking are accomplished by a single tool. The consequent trueness or concentricity of countersink to hole results in prolonged tap life and a more accurately held hole size. When separately-produced countersinks are large and eccentric, the taps tend to run down the countersinks first and then correct themselves in the hole. Quite often this results in an oversize condition in the first three or four threads.

In addition to prolonging tap life, drilling and countersinking, or drilling and counterboring on parts that weigh up to 50 lbs, eliminates wrestling large pieces so that you may save 35-50 min drilling and countersinking a dozen holes. If one has to stop, disengage the tool, and install another, the cost of manufacturing a hole, both operations included, is 2½ times what it would cost were the operations combined in a single tool. Economics here are challenging.

Web Thinning

Thinning the web of a drill reduces the end pressure and hence the drilling effort. Our recommendation for optimum web thinning is the use of the split point. Special fixtures, especially for large drills, must be made to attain the split point. We have increased production from a group of 160 machines by 25% without any increase in feeds and speeds, simply by split point thinning of the web in drills 1⅝" to 6" dia. In this case, the relieved drilling pressure due to web thinning resulted in elimination of trouble from slipping clutches. We found that the operators had not increased the speeds and feeds; the machines were simply producing more because the clutches weren't slipping.

Three- and Four-Flute Drills

Where a hole has only to be opened up, from a cored or previously drilled hole, the use of three- or four-flute drills will triple or quadruple production. The four-flute drill may be preferred because of the ease of measuring it, but the three-flute drill has more strength and better flute clearance. For this reason, I would use a three-flute drill on a long run job, and buy the measuring tools and charge them to the job.

Chip Congestion

The chip congestion problem is basically one of clearing the chips out of the hole. This sometimes requires chip breakers, even when drills are as small as 3/16". We tried every other method before grinding chip breakers in small drills since they appreciably weaken the drills. Also, chip breakers result in more of the drill being ground away during sharpening.

Important to successful chip removal is the selection of the proper spiral for the job. You will find that by trying both slow and fast spirals you will come up with the ideal spiral for getting the chip out of the hole.

In cast iron, using an air jet and adding the spray to it to blow the chips out will result in more holes between drill sharpenings.

We have found that mist coolants afford the advantages of the air jets, plus the fact that with them you can blow the oil or coolant down into the hole and cool the chip. As a result we have improved tool life.

Gun-Drilling

Gun-drilling can be applied to almost any operation. The first requirement is a large enough pump and coolant system. The important thing for a ½" drill is to have at least 5 gal/min and 1000 lbs pressure. Also essential are adequate filters for clearing the coolant so that pumps will not be harmed by fines suspended in the oil. Extremely high pressure lubricants are required.

Control of Chips

Chip size may be controlled in many ways. Very often a reduction in spindle feed will give you an increase in drill life, depending on the depth of the hole. Sometimes an increase in feed will accomplish the same thing, again, depending on the size of the drill. Chipbreakers are a last resort, and can be added to break the chip into a figure "6", an ideal chip shape. In deep holes, use of "woodpecker" attachments to break the chip works very well.

Repointing of every drill most carefully and accurately for center will improve drill life. Thinning the web to one-half of the production standard will also make a better drill. The chip controls then are related to the feed, the material, the depth of penetration, and the spirals of the drills. Each job has to be evaluated in these respects. These evaluations, put drilling into the highly sophisticated order of machining. end

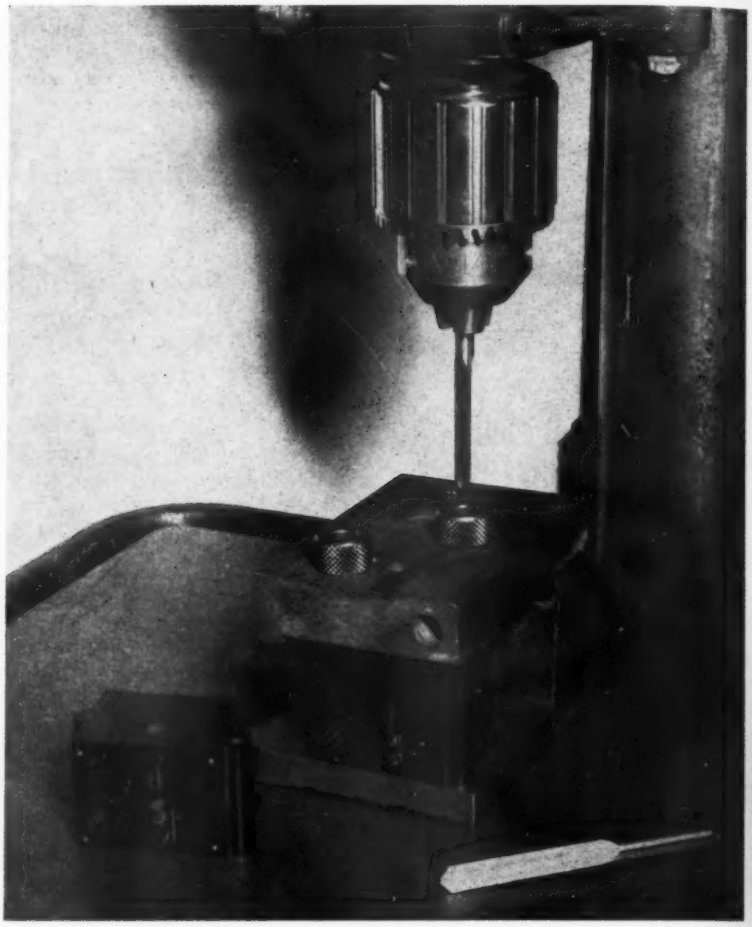
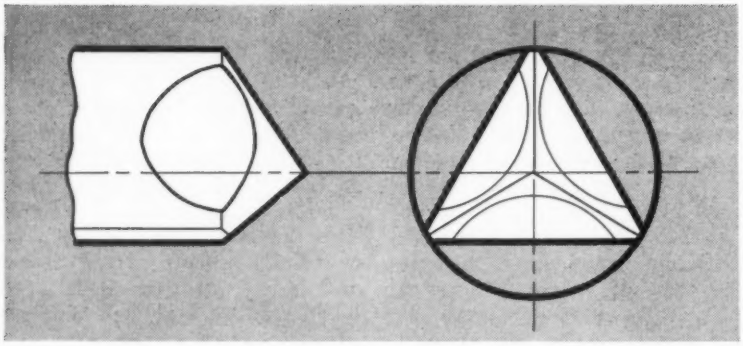


Fig. 1 Steel sleeve in explosive circuit breaker is drilled without annealing, although hardness was Rc 62-64. Sleeve had collapsed when hot metal was cast around it.

Hot Drills for Hard Parts



ANNEAL FIRST, DRILL LATER. That's an effective way to put holes in hardened steel, if the softening effect can be confined to the chips removed in the drilling operation. A drilling method that does just this has been in use for 18 yrs, and is still finding new applications on production and salvage work. It produces holes with good finish, and allows drilling of work in the fully hardened condition without separate annealing.

With this method, the work directly beneath the drill point is annealed by frictional heat, and the softened metal is removed as a chip. This is done by running a triangular Hardsteel drill at high speeds. The drills are made by

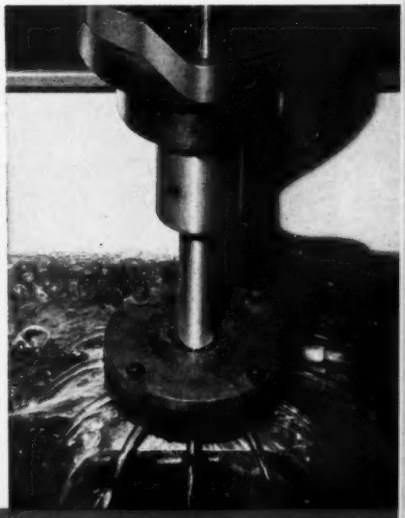
. . . Continued on page 66

CINCINNATI

CINCINNATI offers you 3 types of electrical machining equipment...

ELECTRICAL DISCHARGE MACHINES

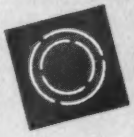
ELECTROLYTIC GRINDING MACHINES



ELECTRO-CHEMICAL MACHINES

Cincinnati builds 32 basic EDM machines, greatly extending the possibilities of this process. Applications include forming, piercing and die sinking on any electrically conductive material, regardless of hardness and fragility, or unusual geometry of the operation. Part shown is copper anode for an electron tube, in which slots were electrical discharge machined. Publication M-2077.

Cincinnati Electrolytic Grinders handle a wide variety of general-purpose and cutter and tool grinding applications, offering substantial savings in grinding wheel costs and in grinding time. Metals that are ordinarily hard to machine or subject to thermal damage can be handled easily and safely because of the "cold machining" nature of the process. Excellent for small parts like the needles at left, which cannot tolerate burrs or metal smear.



For vertical feed, through-hole production applications in hard-to-machine metals. ECM leaves a burr-free surface with no thermal change, opens new areas of cost reduction. Part at left is tough steel, ¼" thick, in which narrow circumferential slots were machined by the electrochemical process.

There are three general classifications of electrical machining, each having particular advantages that solve production problems across the complete field of metalworking. Cincinnati Milling builds equipment for all three, and is prepared to show you the potential for widening design horizons and reducing costs in your shop.

Which Electrical Machining Process is best for you? *Cincinnati has the knowledge and experience to apply the right process to solve your particular machining problem. We will appreciate the opportunity to tell you more.* MILLING MACHINE DIVISION, THE CINCINNATI MILLING MACHINE CO., CINCINNATI 9, OHIO.

KNEE TYPE AND BED TYPE MILLING MACHINES • DIE SINKING MACHINES • CUTTER AND TOOL GRINDERS • VERTICAL BROACHING MACHINES • ELECTRICAL MACHINING EQUIPMENT

CINCINNATI

MILLING MACHINE DIVISION

CIRCLE INFORM-A-GRAM KEY NO. 65

. . . Hot Drills from page 64

Black Drill Co., Cleveland, Ohio. About 5 sec after the drill contacts the surface of the work, chips are formed. By that time frictional heat builds up to the annealing temperature, and the metal in contact with the drill point becomes soft enough to be removed. Chips form continuously as the drill is fed into the work.

A recent application of this drilling method was on a part used in explosive circuit breakers for high voltage systems. The cast iron part has a hardened and ground steel sleeve and the R_C 62-64 sleeve had warped and partially collapsed when the hot metal was cast around it. A ⅜" Hardsteel drill (Fig. 1) was used to successfully straighten the hole without annealing the part.

On another job, a salvage attempt worked out so well that now it's used as the regular production method. The part (Fig. 2) is a high pressure nozzle for an injection molding machine. Air hardening tool steel is turned in one piece and then hardened to R_C 63. A hole through the center of the 4½" length of the piece had originally been made before hardening, but was drilled to 3/16" instead of the specified 15/64". To save the expensive part, the hole was reamed to the proper size in the hardened condition with a Hardsteel drill. Now it's standard procedure.

Fig. 2 Hole through center of 4½" long high pressure injection molding nozzle at Rc 63 is enlarged without annealing the part.

The three-sided drill used in this way has small chip clearance grooves ground into each face. Speeds required are higher than those with twist drills of the same size to create the needed heat. Proper spindle speed and adequate pressure must be maintained throughout the drilling operation. The shorter the drill, the better the results.

Jigs are used in the same way as they are with twist drills. Removable bushings help, because they can be removed after the hole is spotted, shortening the distance of chip travel for the remainder of the operation. On curved surfaces, a jig is especially important to avoid "walking"; when a jig is not available, an appropriate flat can be ground on the surface to allow spotting the hole.

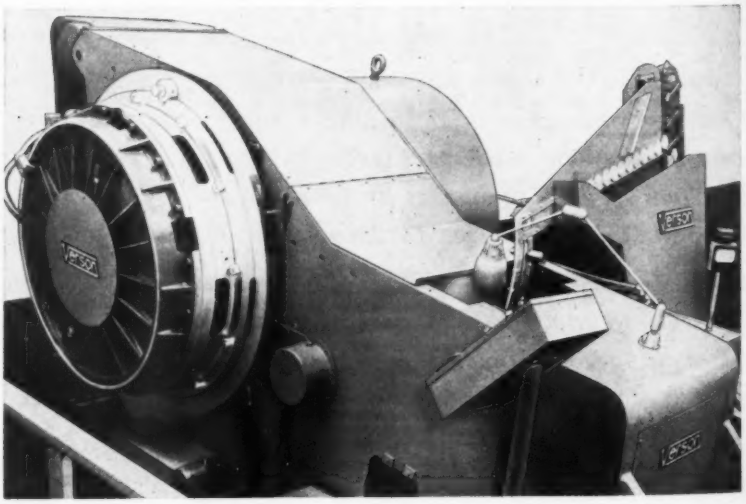
The good performance of the drills at high speeds is mainly due to the properties of the cast alloy from which they are made. Franklin G. Gepfert, president of Black Drill Co., won't disclose the composition or the casting technique used except to say that it's a chromium-cobalt-tungsten base material with an as-cast hardness of R_C 64.

The high red-hardness of the alloy allows drill operation at high speeds without softening from the high temperatures generated. Best results are obtained on production jobs hardened higher than R_C 38 but work hardening materials are easily handled as well. The Hardsteel drills are not effective on soft materials or parts that haven't been heat treated, and are reserved for applications normally beyond the range of ordinary twist drills.

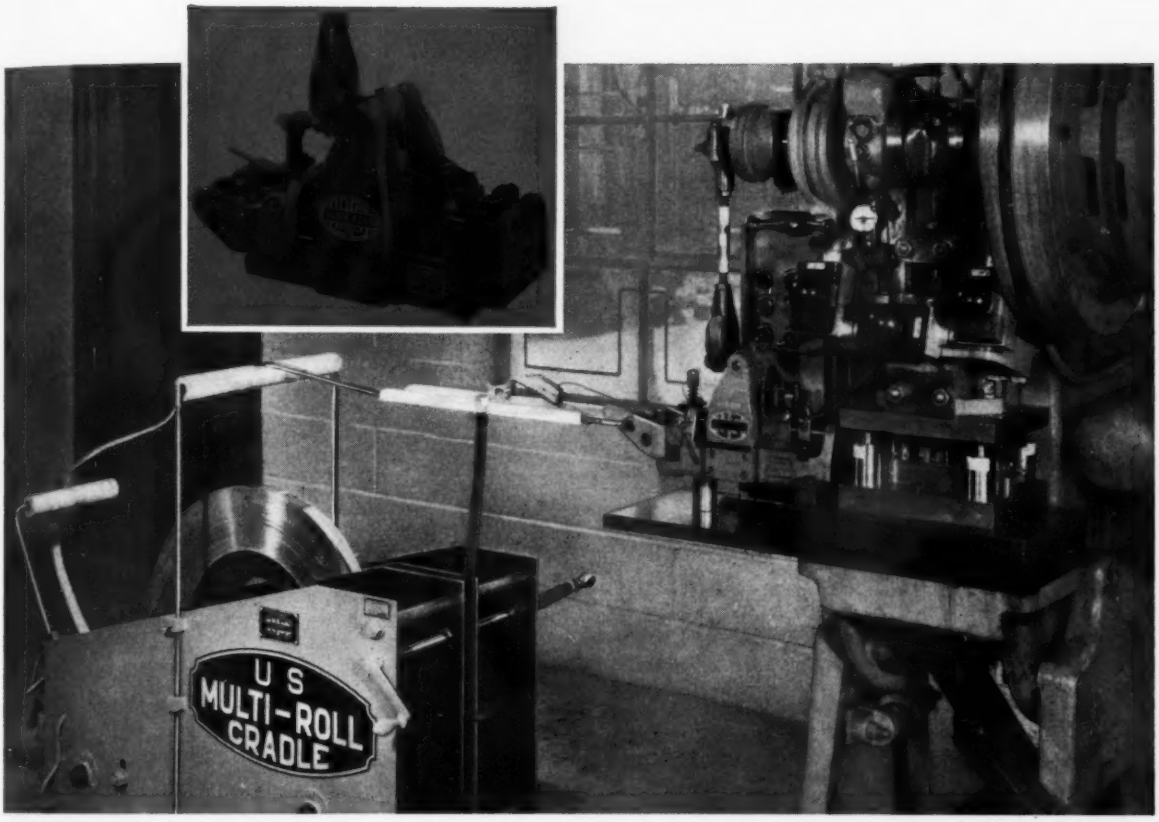
Other uses of the heat and wear resistant alloy are for tool bits, dies, and parts subject to severe environments. One Hardsteel part used in missile work is a ⅜" OD, 4" long rod cast by Black Drill with a 0.004 dia hole through the center. **—Weiner**

Can Extrusion Press

A new can extrusion press has recently been announced by Verson Allsteel Press Co., Chicago. Operating at 200 spm, it extrudes an aluminum can in a single stroke from a 2.6" dia x .164" thick slug. This horizontal machine, rated at 400 tons and utilizing a hopper feed, is well suited for canners wishing the combination of economy and convenience.



U.S. Slide Feed produces at 620 strokes per minute ...tolerances to ±.001″



U.S. Slide Feed No. 22A, adapted for high speed production and U.S. Multi-Roll® Cradle No. ACC-19C at Triangle Tool Company.

Triangle Tool Company, Union, N. J., using U.S. Slide Feeds, runs continuous production at the rate of 620 strokes per minute. Coil stock, 1010 dead soft, .010″ thick x 2″ wide is fed into a 9-station all carbide progressive die. Feed length is 1.125″. Tolerance is held to ± .001″ without the aid of pilots. ■ Of all feeds tried by Triangle Tool Company, only the U.S. No. 22A Slide Feed proved capable of maintaining the required tolerance at this high speed. ■ The Feeds used are a variation of standard No. 22A U.S. Slide Feeds modified for high speed operation.

Bulletin #85-60-T describing U. S. Press Room Equipment will be sent upon request.

MULTI-SLIDE

U.S. TOOL COMPANY, INC.

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U. S. Multi-Slides® • U. S. Multi-Millers® • U. S. Automatic Press Room Equipment • U. S. Die Sets and Accessories

CIRCLE INFORM-A-GRAM KEY NO. 67

Aluminum Cans Quickly Fabricated, Conveyed

A fully mechanized process for manufacturing drawn, pre-coated aluminum cans was unveiled recently by Central States Can Corp.

E. W. Bliss Co. and Kaiser Aluminum and Chemical Corp. joined in research with the Massillon, Ohio firm to engineer the system. The can it produces has an easy-opening lid that embodies a tab which is pulled to remove the lower seam so the top can be removed. The lid itself has a deep-counter-sunk shape so it may be placed back on the can, and a sung-fitting plug.

The line can produce cans in three basic sizes: 2½ x 1½, 2½ x 2½, and 3-7/16 x 1-13/16".

Fabricating equipment is composed of three basic units. During the first stage, coated aluminum coil is blanked, and the initial draw — up to half the diameter of the final can — is made.

For cans of greater height, the second draw is completed on an automatic re-draw press. Trimming and flanging operations comprise the third stage, with the completed cans then conveyed to packing operations.

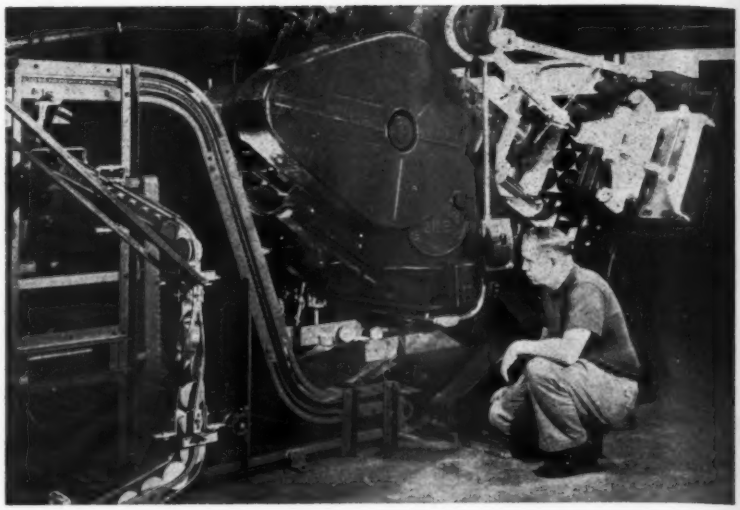


Fig. 1 This 60-ton Bliss blank and draw press discharges cups into an unscrambler which aligns them in an open-end-up position for transfer to a rotary re-draw press.

The line is completely automatic, with overhead conveyors transporting material through all stages. One operator and a packer can process from 200 to 240 cans/min. Cans are conveyed to a rotary machine which curls the flanges of the can in preparation for the crimping of the top to the body.

Drill Press Tries Swaging —and likes it!

A modified 17" Delta drill press is invading the realm of portable swaging tools, and beating them at their own game. The press swages about 250 oil cooler tube ends per hour at United Air Lines' Engineering and Maintenance Base, San Francisco. That's twice as fast as United did the job with a portable swager.

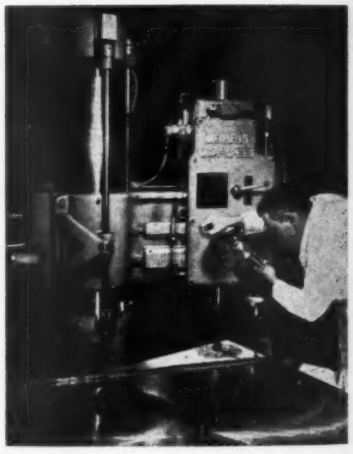
Radial Drill Slashes Labor Costs

A 9" column radial drill with a 4' arm has run without maintenance for three yrs, and has cut labor costs by 15%, according to Wright Mfg. Co.'s vice president in charge of production.

Lewis N. Tenney says his firm has kept the unit in constant use to drill and line-ream pin and bushing holes in the die sets they make to produce the air conditioning products the Phoenix, Ariz., company manufactures.

Morris Machine Tool Co., Cincinnati, Ohio, supplied the radial drill. In the typical operation shown here, it bores 2½" dia guide pin holes in a cam-joggle die used for forming tops and bottoms for Wright coolers. An auxiliary bed section and knee are employed with the drill.

Tenney cites these as the drill's maintenance and labor-saving features: rugged construction, centralized controls, exceptional balance, and accurate spindle speeds and feeds. It offers a feed range from 0.004 to 0.025, and spindle speeds from 56 rpm to 3000 rpm. A fully enclosed elevating mechanism with an electric column clamp provides further safety and ease of operation, according to Tenney. The roller-bearing mounted head is said to increase the machine's flexibility, and reduce maintenance.



THE NEW POPE 10-6

Super-Precision Twin-Head
Electrically Programmed

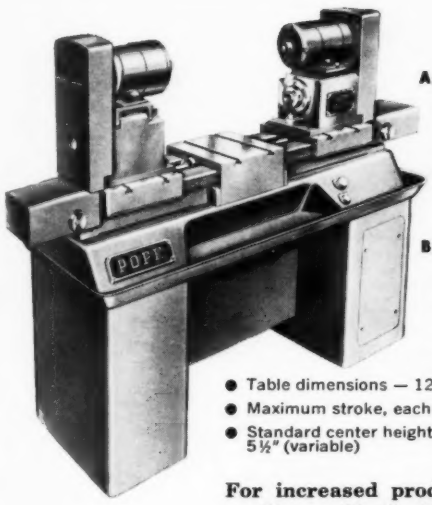
BORING MACHINE

BORES MORE ACCURATE* HOLES

BORES MORE PER HOUR

BORES AT LOWER COST

* POPE Boring Heads are capable of boring holes round within 25 millionths (.000025)



A. Two precision* boring heads moving toward the work simultaneously or completely independent of each other produces twice as many workpieces per hour.

B. The Pope Electric Programmer permits quick, simple dialing of the complete operating sequence — thereafter, continuous production of accurate parts, cycle after cycle.

- Table dimensions — 12" x 12"
- Maximum stroke, each head — 6"
- Standard center height — 5½" (variable)

For increased production of precision parts, at a profit, specify the Pope model 10-6 boring machine. Full details in bulletin S-21. Write for a copy.

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ENGINEERS, DESIGNS AND BUILDS PRECISION ANTI-FRICTION BEARING SPINDLES FOR EVERY PURPOSE

POPE MACHINERY CORPORATION • 261 RIVER STREET • HAVERHILL, MASS.

Established 1920

CIRCLE INFORM-A-GRAM KEY NO. 69

You get peak performance only with quality tools

When only the best cutting tools are good enough, always specify CLEVELAND *Quality* Tools. They are the *finest* you can buy . . . and also the *most economical.*

Our intensive program of quality control starts with the raw materials from which the tools are made. Not only does our Laboratory devote a great deal of attention to specifying and inspecting raw materials, but we also work closely with the suppliers of our high speed steels and carbides to assure that consistently high quality is maintained.

Thus we make doubly sure that every shipment meets our exacting requirements before it is accepted and placed in stock, as shown in the photograph. This establishes a firm foundation for the subsequent heat treating, milling, grinding and other operations through which the steel must pass before the ◈ trademark is placed on the finished tools.

Telephone your Industrial Supply Distributor. He can give you prompt delivery of CLEVELAND Quality Tools from stock, and can make arrangements for one of our trained Service Representatives to help you solve your cutting tool problems.

THE CLEVELAND TWIST DRILL CO.
Cleveland 1, Ohio

QUALITY CUTTING TOOLS • BEST SERVICE THROUGH YOUR LOCAL DISTRIBUTOR

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Don't settle for less than the best

BAY STATE Taps and Dies are the highest quality . . . consistently.

This assurance of quality is the result of carefully controlling every step in manufacturing. From precise selection of the best steel, through every operation and many inspections, no effort is spared to produce *the best*.

One of the operations is precision thread grinding, illustrated above. Here, as elsewhere in the complex process of making threading tools, *quality* is built into BAY STATE Taps and Dies by skilled craftsmen and modern equipment.

That's why BAY STATE Taps and Dies give you better performance. Don't settle for anything less than the best!

Sold through Industrial Supply Distributors, BAY STATE *Quality* Taps and Dies are always available when you need them—and at lower cost than would be possible with any other method of distribution.

BAY STATE TAP and DIE CO.
Mansfield, Mass.
Subsidiary of The Cleveland Twist Drill Co.

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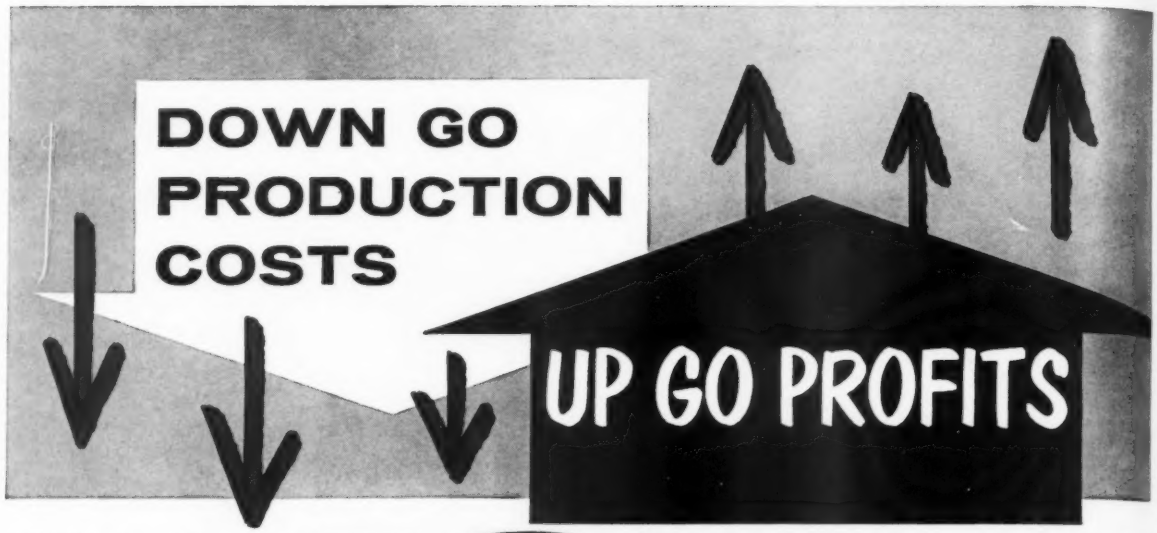
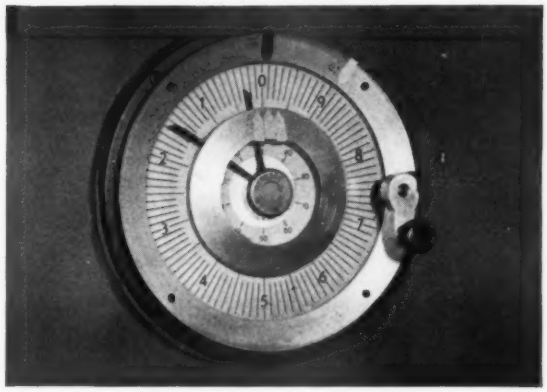
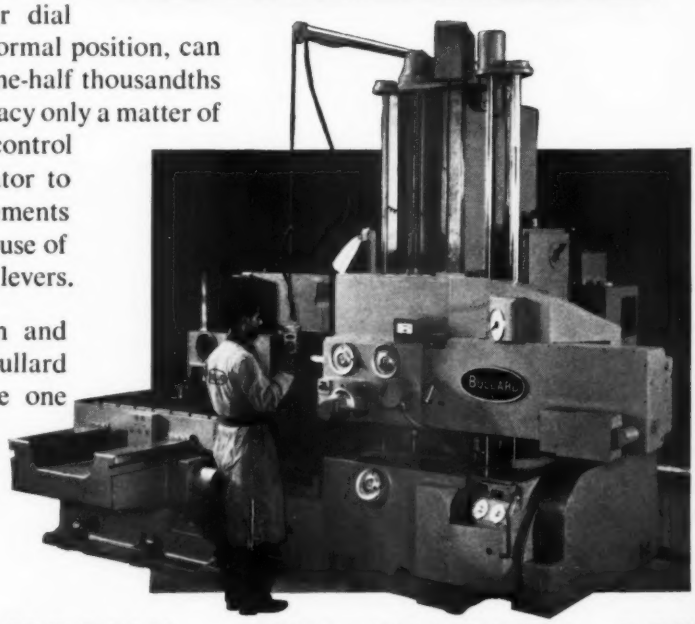


With the NEW BULLARD DYNAMILL H.B.M.



The controls, which have made it possible for Dynamill to reduce non-productive positioning time to a minimum, feature variable traverse rates recorded on large, clock-type dials, and controlled by Bullard's remote control pendant.

Head, table, saddle, and spindle each have a separate three-pointer dial which the operator, from his normal position, can easily read to an accuracy of one-half thousandths of an inch with further accuracy only a matter of simple interpolation. The remote control pendant allows the operator to traverse and position all elements under power without the use of handwheels, cranks or levers.



These and many other design and construction features of the Bullard Dynamill H.B.M. make it the one machine you

must investigate before buying any horizontal boring machine.

THE BULLARD COMPANY BRIDGEPORT 9, CONN.

CIRCLE INFORM-A-GRAM KEY NO. 72

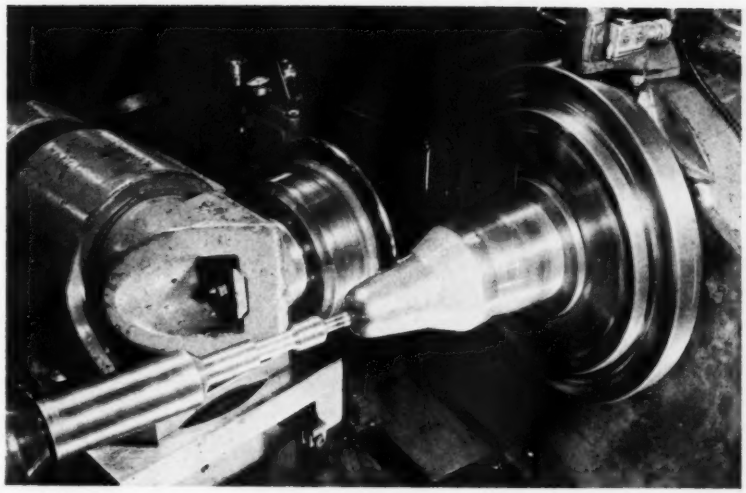


Fig. 1 Stainless steel nose cone for Explorer missile begins to take shape on Floturn machine. The process accurately shapes a flat blank into a seamless cone by stretching the metal over a mandrel of cast-to-shape tool steel.

Modern Potter's Wheel For Seamless Cylinders

BLANKS OF HARD-TO-WORK METALS are formed into deep cylinders, cones, and other shapes for aircraft and missile applications on a space-age version of the ancient potter's wheel. The one-piece, seamless parts are shaped on Floturn equipment in a process akin to cold rolling.

The wheel and hand-shaping process of the pottery worker is replaced by a polished metal roller which progressively presses the rotating blank against a precision-finished mandrel, "stretching" the metal to the shape of the mandrel. Displacement of the metal is parallel to the centerline of the part being formed.

Tools for the process are made from cast-to-shape tool steels, resulting in savings in machining time and material. Use of the cast-to-shape tools has contributed to the success of the process in forming parts that were either impossible or too costly to produce by most established fabricating methods.

In addition to the horizontal machines pictured, vertical units for production of building-high missile casings, and machines capable of forming a 6′ 8″ dia cylinder, have been developed. end

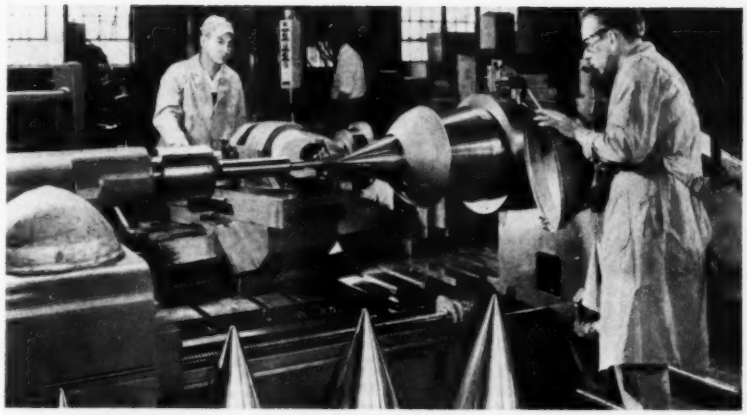
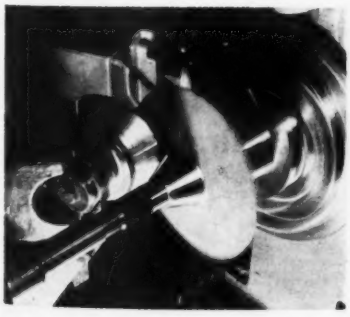


Fig. 3 Preformed stainless steel blankets shaped into seamless tailcone for jet aircraft as operator on right readies next blank.

Fig. 2 Whirling stainless steel blank is formed into an inner support cone for a jet engine component. Roller pressing against the blank stretches the metal over precision-finished mandrel.



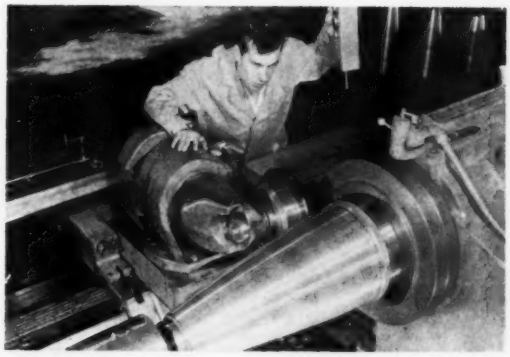
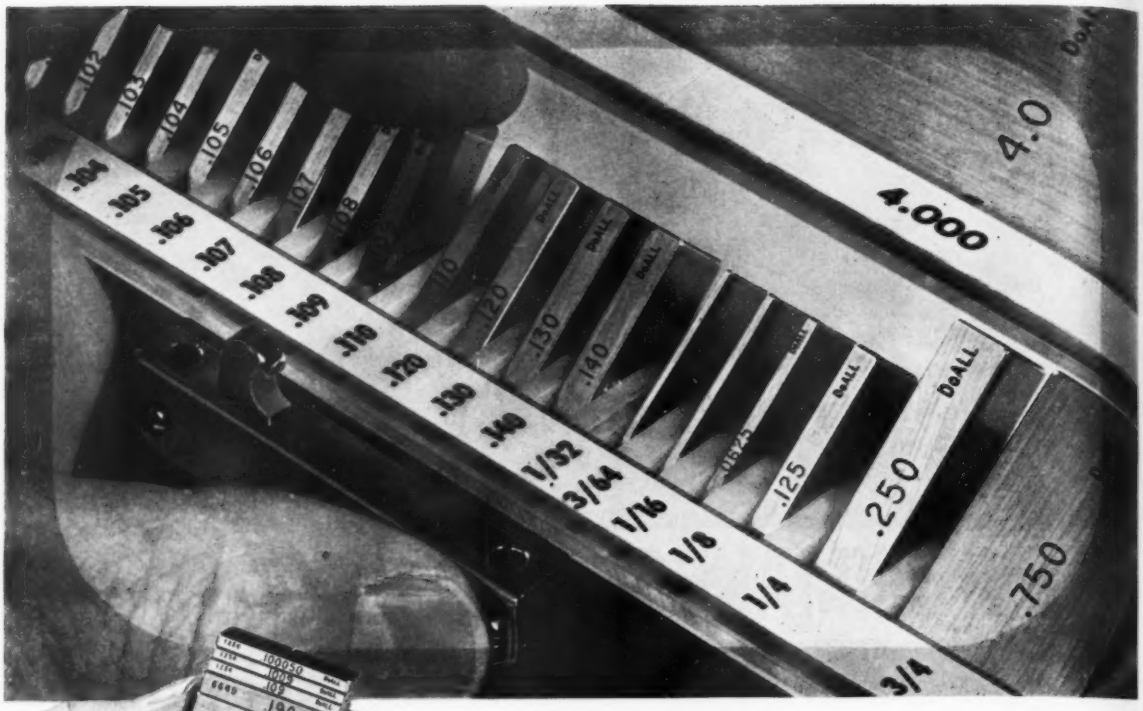
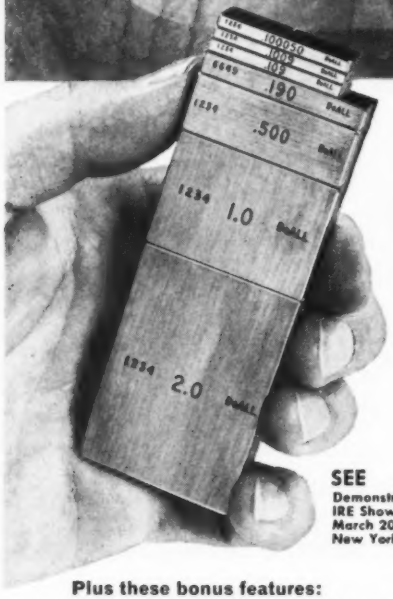


Fig. 4 One-piece, stainless steel missile skin nears completion.





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DoALL *STAINLESS STEEL* GAGE BLOCKS

See these new gage blocks made of stainless steel. At a cost only slightly more than regular blocks and less than chrome carbide or chrome-plated blocks—you get guaranteed performance and *Assured Accuracy*.

Here's why:

- HARDNESS—Over 68 Rockwell C any place on block surface.
- WEAR—More than three times the life of ordinary steel blocks.
- CORROSION RESISTANCE—Up to five times greater than steel blocks.
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- COEFFICIENT OF EXPANSION—In the range of most steel materials.
- BRINELLING—Spindle impacts do not brinell DoALL stainless steel blocks.

DoALL stainless steel gage blocks are available in standard sets with AA and A+ accuracies.

Plus these bonus features:

Size —marked on the side of each block—visible when wrung.

Case —new, self-indexing, easy to use. Eliminates touching gaging surfaces of blocks.

Care —complete maintenance kit for care of gage blocks.

Certified—Certificate of Inspection covering each block in set.

Call your local DoALL store today. Ask your DoALL Gage Specialist to demonstrate the new stainless steel gage blocks.

GB-39

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Call Your DoALL Sales-Service Store

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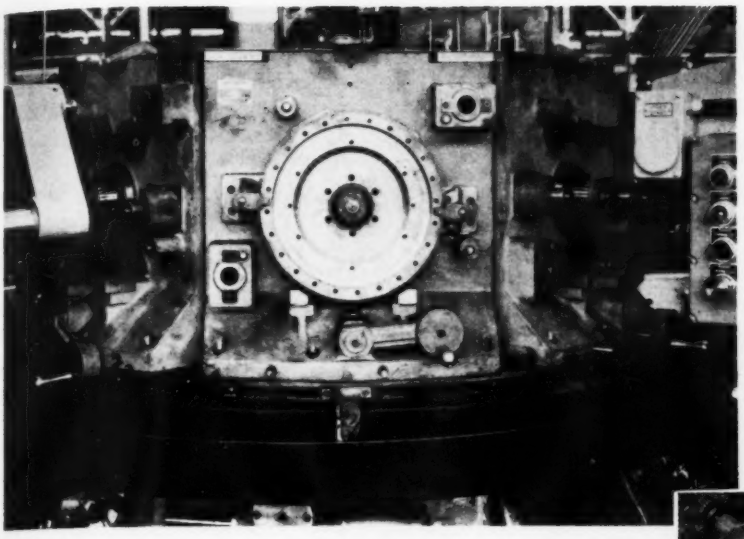
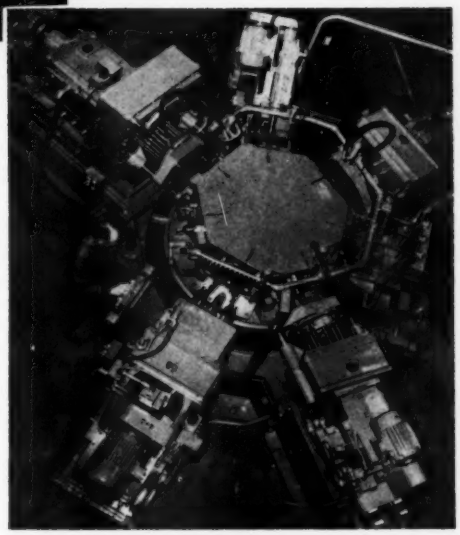


Space-Saving Merry-Go-Round



A new carousel-type machine which performs all drilling, reaming, counterboring and tapping operations on two different automobile flywheels makes maximum use of minimum floor space. The table is surrounded by six machining units and one loading and unloading station.

Each flywheel is secured in a vertical position against the table side by a precision collet which expands through the center hole in the flywheel. As the table indexes, multiple and single spindle drill units drill 40 holes, ream 14 and counterbore and tap six. Pushbutton controls enable the operator to select the machining necessary for either flywheel.

The unusual machine, designed and built by National Automatic Tool Co., Inc., Richmond, Ind., simplifies flywheel handling.

Chip removal is automatic. A brush moves with the turntable, sweeping chips before it into an underfloor conveyor.

Improved Dies Slash Tooling Costs

A little horse sense has resulted in bonuses for both parties in a tooling transaction in Detroit.

A large producer of stampings recently required a replacement set of seven dies for the manufacture of farm tractor fenders. Congress Tool & Die Div., Tann Corp., submitted its bid for the job, then went a little further by submitting a bid for a set of three dies to produce improved design fenders faster than the stamper was doing it.

The original set of seven dies, consisting of an initial drawing and corner-trimming die, two more trimming dies, a flanging die, two curling dies and an embossing and piercing die, turned out 100 fenders/hr.

With the improved design three-die set, drawing and corner trimming is performed in the first die as before, but now all remaining trimming is finished in the second die. The final die does curling. It turns out a smooth curl on the bottom edge of the fender, which was formerly a hazardous, sharp-edged flange.

The bonuses? Production has been boosted to more than 300 parts/hr, with fewer operators and presses than before, and the stamper saved money by buying only three dies. Congress Tool & Die has profited by a broadening of its die design reputation.

Modified Hand Mills Increase And Improve Production

INCREASED PRODUCTION of the countless smaller parts made of Synthane, industrial thermosetting laminated plastic, has resulted from the use of versatile, easy-to-operate hand mills which have been modified to speed and improve performance.

In the milling machine department of Synthane Corp., a leading manufacturer and fabricator of laminated plastics at Oaks, Pa., there are 17 No. 1 U.S. Hand Mills, made by the U. S. Burke Machine Tool Div'n., The Cincinnati Mfg. Co., Cincinnati. These machines effectively meet production requirements because they are faster-operated and more flexible than conventional machines of a similar type.

These mills have been made even more productive through Synthane's addition of electrically actuated air cylinders and Hydro-Checks, made by the Bellows-Valvair Div., IBEC, Akron, Ohio.

More laminated plastic parts can be handled by the hand mill because of its flexibility. With the air cylinder modification, the head can be moved up and down hence the machine can quickly cut or trim a variety of parts.

Synthane Corp. developed, after considerable experimentation, an automatic, low-cost method of meeting high production schedules for parts requiring close tolerances through the control of a cutting tool's movements. Electrically-actuated air and hydraulic cylinders were placed on all the Burke hand mills, thus permitting lateral movement of the table and vertical movement of the head as may be needed for each milling job.

In addition to freeing skilled manpower from constant supervision of manual operation of the hand mills, the use of air cylinders and the efficient Hydro-Checks has directly contributed to increased production. Now easy to operate, the hand mills relieve operator-strain, thus minimizing fatigue and helping increase output.

The air cylinders provide a simple, economical means of moving the hand mill. The major problem was control, to assure precision milling. But by use of air cylinders with integral Bellows Electroaire valves, the cylinder response was found to be extremely reliable cycle after cycle. Controlling air cylinder travel with Hydro-Check provides the necessary smooth operation.

To provide proper timing, avoid the "bounciness" of air, and meet the problem of variations because of temperature, an air cylinder whose speed could be adjusted with a Hydro-Check was used. This timing system has performed accurately, and has prevented any variations because of compressibility of air; after a short warm-up there is no difficulty with viscosity change.

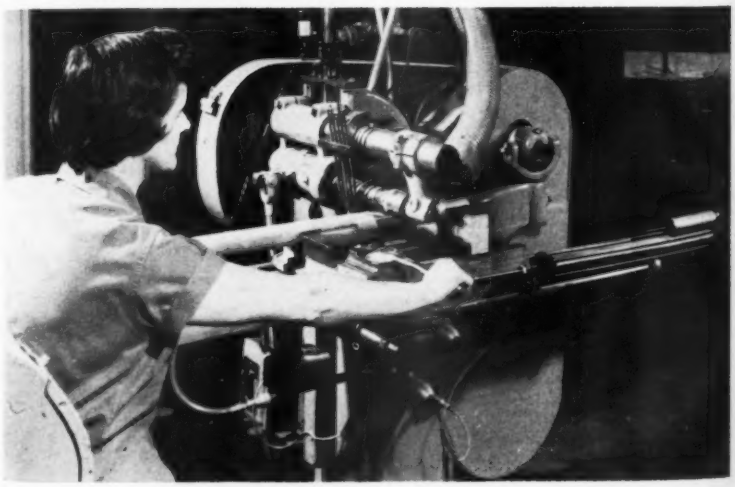
Among the smaller parts milled by Synthane with these setups are bushings, breaker arms, spools for textile and photographic components, shafts for the radio and television industry, screw slottings, and all types of insulators, coil forms, etc.

One of the current applications of the hand mill is the milling of air tubes which are being slotted for a new Eastman Kodak product. A new automatic X-ray processing system, the Industrial X-Omat Processor delivers a dry ready-to-read photo in just 13 min. This machine uses Synthane plastic parts, which play an important role in the new process.

The hand mill can do two operations at one time, either manually or by automatic operation. Synthane has adapted one of the machines for cutting a long slot in grade LB (fabric-base) laminated plastic tube for the X-Omat Processor, and has lengthened the hand mill table for this special part.

Over-all ease of operation, plus the hand mills' versatility, have helped to speed output and lower production costs for the dozens of smaller Synthane parts which are milled for virtually every industry. When Synthane Corp. perfected the use of air cylinders for its hand mills, these machines became even more important than they had been as key production tools. end

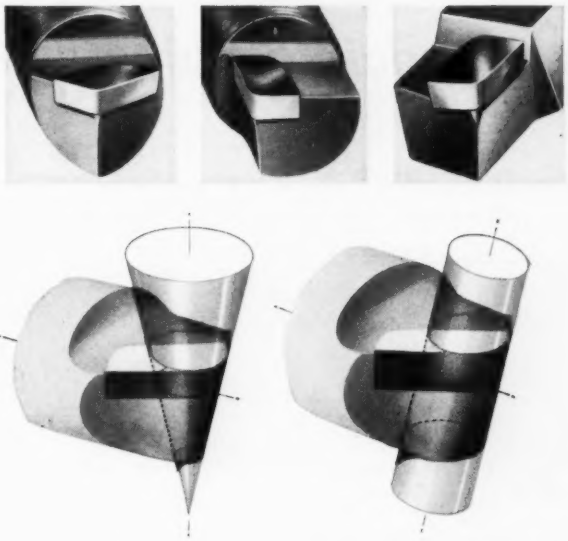
Fig. 1 Seventeen Burke hand mills equipped with Bellows air cylinders and Hydro-Checks constitute a highly versatile production department. A great variety of Synthane laminated plastics components are milled to close tolerances. The air cylinders have speeded production and lowered unit costs.



special report from Fair Street on cutting tool geometry

ONE OF A SERIES

how proper cone relief grind greatly increases single point tool life... at maximum speeds and feeds



NEW MICROPOINT TOOL GRINDER MAKES IT POSSIBLE

In a previous report the importance of relief angle and its bearing on tool life was discussed. Just as important as the relief angle is the manner in which this angle is generated under the nose radius.

There are two grinding methods used to generate the relief angle on a single point cutting tool. One method is called cone relief or constant relief grind. The other method is called cylindrical relief or variable relief grind.

WHAT CYLINDRICAL GRIND IS

Cylindrical or variable relief grind produces a varied relief under the tool point. The relief or clearance varies in such a manner that the most important part of the tool, the tool point, has excessive clearance.

Because of excessive relief under the tool point this all-important point is not provided with proper backing to support the cutting edge. Hence, the unsupported cutting edge quickly chips, dulls and breaks. Accuracy is lost and tool life is greatly reduced.

WHAT CONICAL GRIND IS

Cone relief or constant relief grind, on the other hand, provides uniform clearance around the entire profile of the cutting edge of the tool. Because of constant relief under the nose radius, the tool point receives maximum backing or support at this, the most critical point of the entire machining process. Adequate support at this critical point under the nose radius can increase tool life significantly and will provide better control over accuracies and surface finish. Cone relief grind is the type of tool point geometry made entirely practical by the DeVlieg MICROPOINT Tool Grinder, a new single point tool grinder developed by the DeVlieg Machine Company.

Careful study of the geometric projections above will prove that MICROPOINT is capable of producing a geometrically perfect radius. Further study of the cylindrical grind diagram will show inherent weaknesses of the elliptical form produced on conventionally ground tools.

CONCEPT OF CONE RELIEF IS NOT NEW

The superiority of cone relief grind over cylindrical relief grind has long been known. However, using standard offhand grinding machines, it was practically impossible to capitalize on a conical relief's many advantages. Even today, the DeVlieg MICROPOINT Tool Grinder is the only grinder available that can control by simple direct reading dials a conical or constant relief angle and through its unique and rigid design, can repeat the same relief angle time after time on tool after tool without corrective adjustment.

ANYONE CAN USE MICROPOINT

Another major advantage of the MICROPOINT system of single point tool grinding is the fact that no special skill is required on the part of the grinding machine operator. Inexperienced operators can quickly master MICROPOINT. Control of nose radius, radius tangencies, relief angles and quality of the cutting edge and maintenance of offset dimensions is automatic.

For further information about the DeVlieg MICROPOINT Tool Grinder, please write or visit DeVlieg Machine Company, Fair Street, Royal Oak, Michigan.

DeVlieg

MICROPOINT® TOOL GRINDER

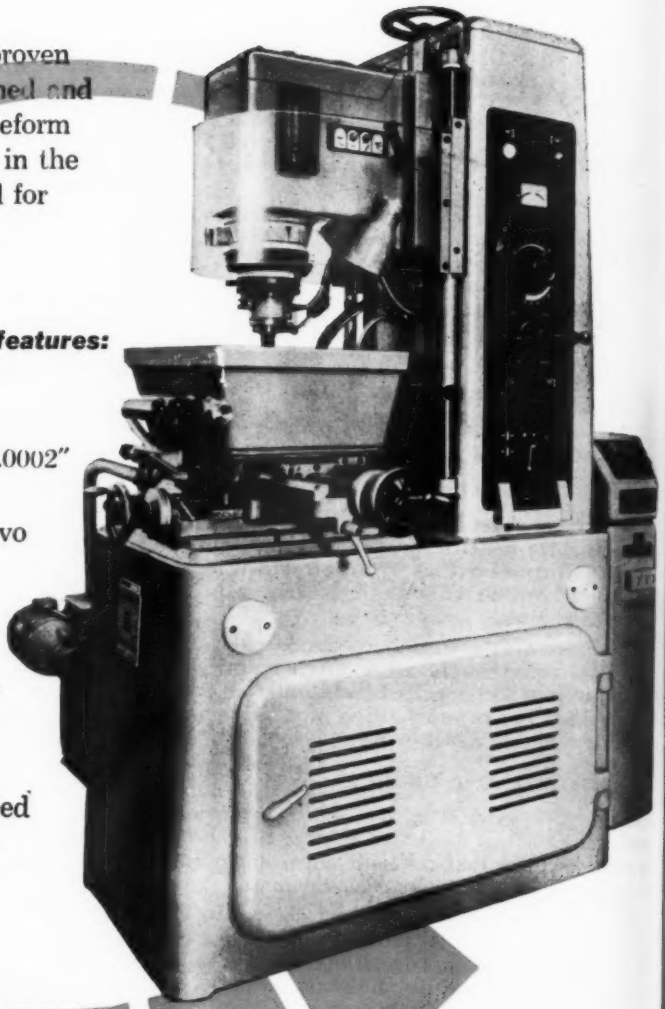
for grinding all sizes and types of round and square shanked tools

CIRCLE INFORM-A-GRAM KEY NO. 77

ELERODA D1

A precision electrical discharge machine

The ELERODA D1 was the first proven electrical discharge machine designed and engineered by CHARMILLES' Eleform Department, pioneers and leaders in the electrical discharge machining field for many years.



Here are some of its outstanding features:

- Magnetic electrode holder for working and locating within ± .0002"
- Specially designed hydraulic servo
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- The most stable electrical power unit on the market (no tubes)
- Highest guaranteed machine speed at 10 micro inches surface finish
- Heavily ribbed castings used throughout
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Complete service facilities available.

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CIRCLE INFORM-A-GRAM KEY NO. 78

Steel Rule Dies Save Dollars at C-V

Steel rule dies, introduced into Chance Vought's sheet metal detail section this year, have already produced man - power savings which total more than $50,000 there.

This small titanium panel, for example, one of more than 1,585 parts produced with steel rule dies, is blanked and pierced in a single operation rather than the multiple operations formerly required. Using a medium sized piece of titanium for an "average part," a saving of 20.47 man-min/pc was realized by utilizing the new process.

The steel rule method employs a wood-metal die set. The punch is flat "steel rule stock," shaped to the form of the finished product and inserted in a wooden form for support. Also inserted within the area of the steel cutting band, as required for holes or unusual openings, are punches. The die itself is of tempered steel, sawed to the exact punch contour and then ground for clearance.

The dies are fitted into a punch press and blanking at pressures up to 600 tons are used.

Savings up to 80% are often realized in building steel rule dies for parts blanking, say Chance-Vought engineers. Average time required to prepare a die by the new method is from one-fourth to one-half the time required to produce conventional types.

AMPCOLOY®

Specify extruded manganese bronze...

AMPCOLOY 666
for economical screw machine parts

Ampcoloy 666 has the following advantages — for commercial screw machine parts:

1. Good physical properties to resist impact and abrasion.
2. Lead addition for improved bearing properties.
3. Good machinability—a rating of 50-60% compared to free-cutting brass at 100%.
4. Remarkably good non-seizing and non-galling characteristics for a high-strength alloy .
5. Light-weight—about 8% lighter than sand-cast bearing bronzes.
6. Resistance to corrosion.
7. Freedom from porosity and sand inclusions.

Ampcoloy 666 is available from stock in convenient mill lengths or cut to your requirements. Write for Bulletin G-53 and name of your Ampco distributor.

D-79

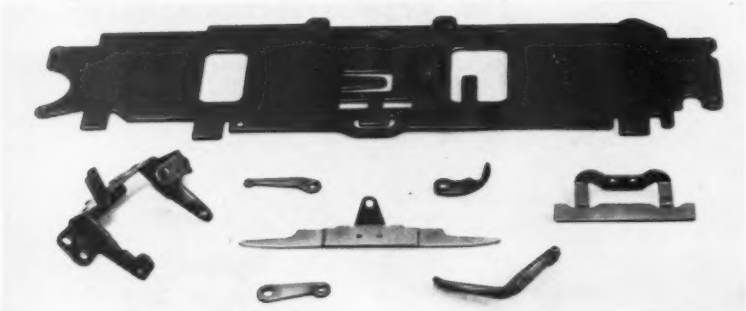
AMPCO METAL

AMPCO METAL, INC.
Dept. 54-C, Milwaukee 2, Wis.
West Coast plant: Huntington Park, Calif.
Southwest plant: Garland (Dallas County), Texas

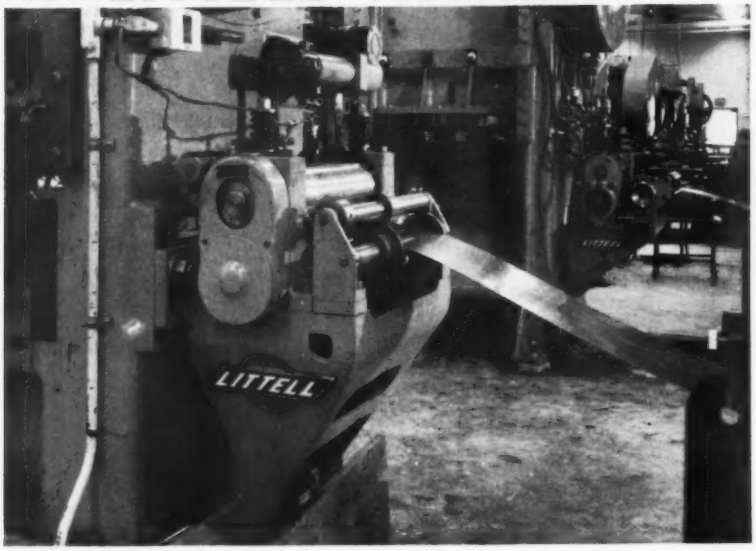
CIRCLE INFORM-A-GRAM KEY NO. 79

Under *SMITH-CORONA* Beauty...

Responsive Steel "Muscles"



From *LITTELL* - Fed Presses



Smith-Corona Portables respond to the touch of racing fingers with speed-record typing. The precision steel parts under their stylish exteriors are integrated into a wonderfully responsive speed-writing machine. Many of these vital parts are stampings. They come from modern punch presses equipped with Littell Roll Feeds. For Smith-Corona production men know from experience that punch presses are at their best when Littell Feeds are attached. Series "A" and "B" Bulletins tell why. Write for them.

F. J. LITTELL MACHINE CO.

COILY Says . . .
"No matter how large or small your press, or how intricate your stampings, Littell builds the single or double roll feed to give you speed and lasting accuracy.
Write for "A" and "B" Bulletins."

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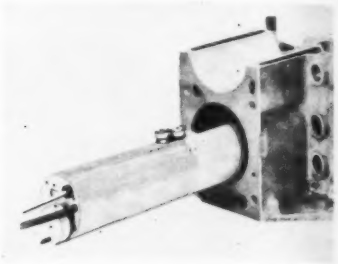
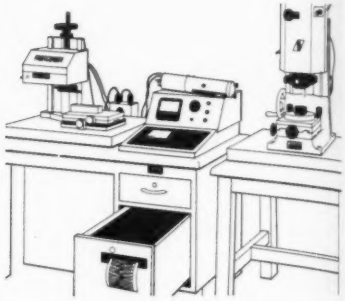
CIRCLE INFORM-A-GRAM KEY NO. 80

Measuring Internal Profiles

Destructive testing may be a thing of the past thanks to Proficorder. This internal linear measuring device gets deep into out-of-the-way places.

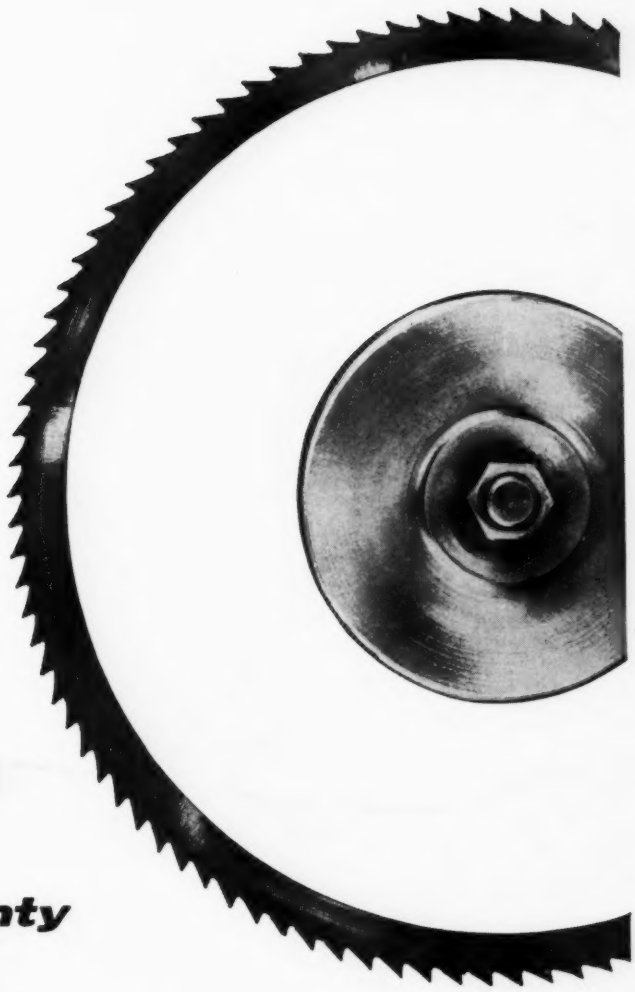


Proficorder is an electro-mechanical instrument for measuring and recording flatness, waviness, roundness, roughness, flaws and total profiles of practically any machined or finished surface. Irregularities are easily detected on a 4" wide strip chart. Even the most minute surface variations can be spotted, since vertical readings can be magnified many thousands of times and horizontal readings



hundredfold. The amount of magnification desired depends upon the character of the surface being profiled, and upon the type of irregularities to be studied. Appropriate magnifications allow study of size, shape and position of irregularities and their relationship to other flaws.

The Proficorder is an inspection and analyzing instrument for production, quality control and research; made by Micrometrical Mfg. Co., 3621 S. State Rd., Ann Arbor, Mich. Inform-A-Gram No. D2.



Every second a cutting tool stands idle while someone loads and unloads a fixture

...costs you plenty

A cutting tool makes money only when it's cutting. The seconds it stands idle while a finished part is removed and a fresh part fed to it are a total loss. That's why dial feeding parts with a Bellows Rotary Work Feeder—the fast automatic way to get parts to and from a machine—can cut machining cost by doubling, often tripling, machine output.

Bellows Rotary Work Feeders, and Index Tables, feed parts swiftly, accurately and safely to the tool—and take them away. All the operator has to do is load and unload while the machine keeps on cutting.

They are inexpensive to buy, inexpensive to install. Like to know more? Phone one of the 200 Bellows-Valvair Field Engineers, or write for Bulletins RT-1022 and RT-1326. Address Dept. TP-361, Bellows-Valvair, Akron 9, Ohio.

Bellows-Valvair

AKRON 9, OHIO

DIVISION OF INTERNATIONAL BASIC ECONOMY CORPORATION (IBEC)

1001-C

CIRCLE INFORM-A-GRAM KEY NO. 81

Sue Perior and Spouse

THE *Exclusive* SET

Exclusiveness is a distinction . . . the reward for challenge and accomplishment.

Superior engineers are constantly alert to the challenges of the die making industry. And through research and engineering skills they have met the challenges and created die sets with exclusive features that have contributed to the die maker's art.

Superior's exclusive features have brought advances to die making and they have brought die set leadership to Superior. Let Superior's many exclusive features work for you!

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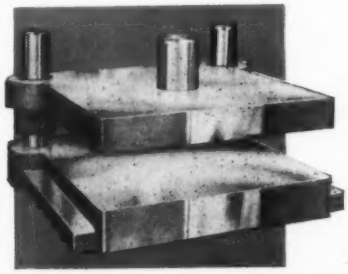

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Manufacturing plants at Milwaukee Wisc. and Cheshire, Conn.

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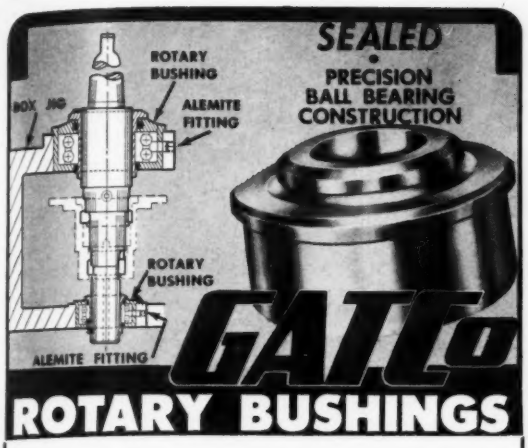

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For DRILLING, CORE DRILLING, ROUGH and FINISHED BORING

The inner race of the GATCO bushing rotates with the tool, piloting the tool accurately below or above the work — or both.

Eliminates expensive tool construction — Reduces tool wear — Prevents seizure and pilot breakage — Especially adapted where precision is required.

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Stainless Steel
TOOLING BALLS

- **Used** in jigs, fixtures and job setups as positive reference points for locating holes and surfaces at compound angles or in two or more planes.
- **Durable.** Made of hardened 440-C stainless steel.
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- **In stock** in 7 ball sizes, ¼" to 1" by ⅛" steps.

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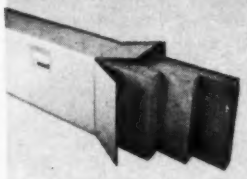
provides the right product and the right package to save you time and money

* epoxy resin formulations for mass casting, surface casting and laminated tools, dies, jigs and fixtures.



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Catalogs and other helpful literature

Bulletin 41 on "Full Flow Dispensers, for oil and other fluids is available from Trico Fuse Mfg. Co., or through Inform-A-Gram C1.

Schematic diagrams, flow charts, and accessory equipment of the MV-74MM building block valve are shown in a brochure from Marotta Valve Corp., circle Inform-A-Gram No. C2.

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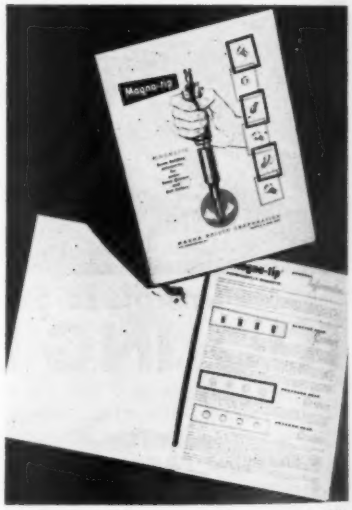
Unipunch tooling, in presses and press brakes, is compared with costs of conventional dies in a new brochure by Punch Products Corp. Circle Inform-A-Gram No. C4.

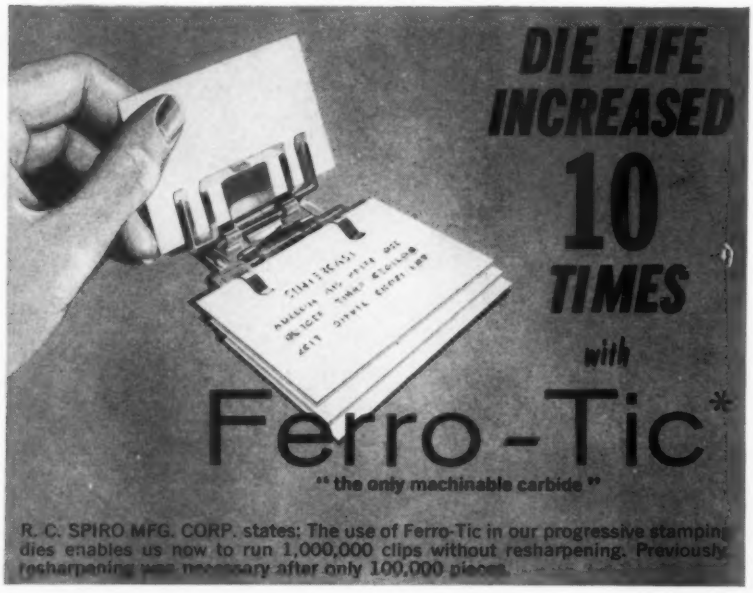
Cold-heating, forming, and cutting tools available from Plew Tool Corp. are described, specified and indexed in a new catalog. For your copy mark Inform-A-Gram No. C5.

Precision radius tools for shapers, planers, boring mills, engine and turret lathes are outlined in a brochure from C. B. Teeter Machine Specialties. Space is also devoted to "Shaplane" heavy duty radius tool. No. C6.

A new tungsten/molybdenum calculator to compute weight and sizes of these refractory metals is offered by General Electric Co. The calculator uses standard density figures for tungstens and molybdenum in the wire and rod conversion tables. Interested? Circle Inform-A-Gram No. C7.



Magna-tip magnetic screw holding accessories for power screw drivers and nut setters are outlined in a catalog from Magna Driver Corp. Inform-A-Gram No. C8.


DIE LIFE
INCREASED
10
TIMES
with
Ferro-Tic*
" the only machinable carbide "
R. C. SPIRO MFG. CORP. states: The use of Ferro-Tic in our progressive stamping dies enables us now to run 1,000,000 clips without resharpening. Previously resharpening was necessary after only 100,000 pieces.

FERRO-TIC combines the fabricating advantages of steel with the wear-resistance of carbide. In the annealed, completely dense state, **FERRO-TIC** can be machined with high-speed tools on conventional tool room equipment; thus, the need for costly diamond grinding is eliminated. Once hardened, by oil quenching from 1750°F, **FERRO-TIC** is extremely hard and wear-resistant. **FERRO-TIC** stock blanks can be fabricated into long-wearing components, using available tools and skill without delay! **FERRO-TIC** is ideal for: Blanking, Lamination, Deep Drawing and Heading Dies, Arbors, Core Rods, Wear Parts, etc. **FERRO-TIC** can be turned, drilled, milled, sawed, tapped . . .

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PROPELLEX CHEMICAL DIVISION, EDWARDSVILLE, ILL.
ELYRIA FOUNDRY DIVISION, ELYRIA, OHIO

*Reg. U.S. Trade Mark

CIRCLE INFORM-A-GRAM KEY NO. 84

let's talk CAPACITY

CAPACITY, what does this represent in terms of dollars to a prospective buyer of metal cutting machines.

We at **MICHIGAN** feel that manufacturing **CAPACITY** is an important asset and most beneficial time saving aid available. We constantly strive to improve our manufacturing and assembly methods, this in turn increases our **CAPACITY.** The ability to manufacture machines in less time, results in a low product cost to the customer.

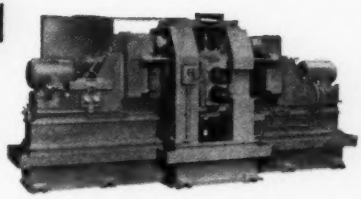
- Modern Building.
- Excellent plant facilities.
- Complete engineering.
- National sales staff.
- Blueprint and duplicating departments.
- Manufacturing facilities to machine every detail in all of our many components.
- **MICHIGAN** designs and fabricates electrical, hydraulic and lubrication installations.

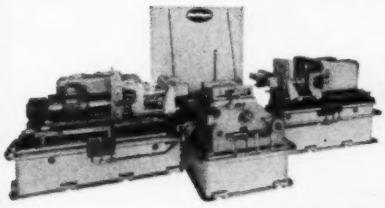
All this represents **CAPACITY.**

MICHIGAN'S CAPACITY pays off in savings to our customers. If you're looking for a special metal cutting machine of any kind, remember **MICHIGAN**—we specialize in dependable delivery, low product cost and excellent service. Send us your inquiries, we will be pleased to serve you promptly.

DIAL

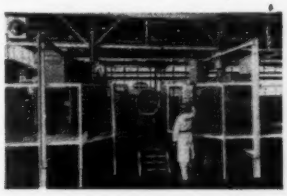
TRUNNION

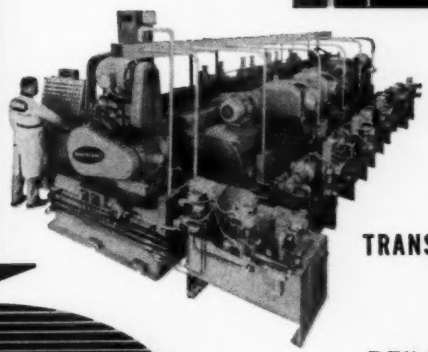




SHUTTLE

SPECIAL





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CIRCLE INFORM-A-GRAM KEY NO. 85

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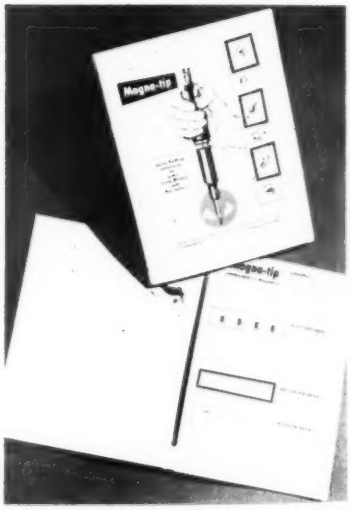

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CIRCLE INFORM-A-GRAM KEY NO. 84

let's talk CAPACITY

engineering & manufacturing

FOR A SINGLE MACHINE OR A COMPLETE LINE

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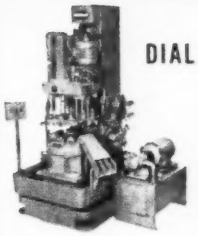
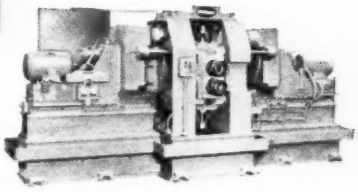
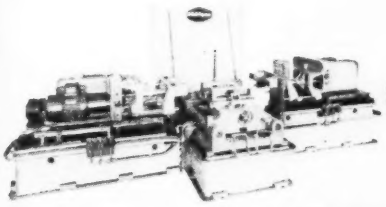


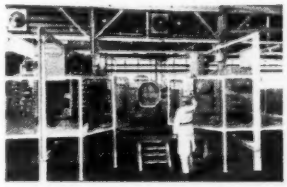
DIAL



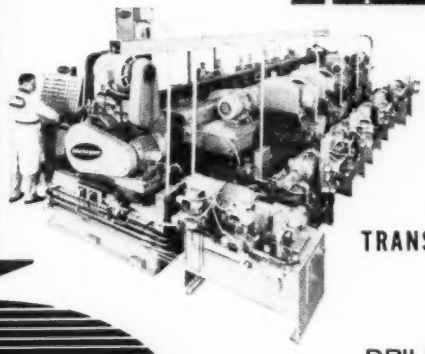
TRUNNION



SHUTTLE



SPECIAL



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COUNTER BORING
BORING
MILLING

CIRCLE INFORM-A-GRAM KEY NO. 85

Catalogs . . .

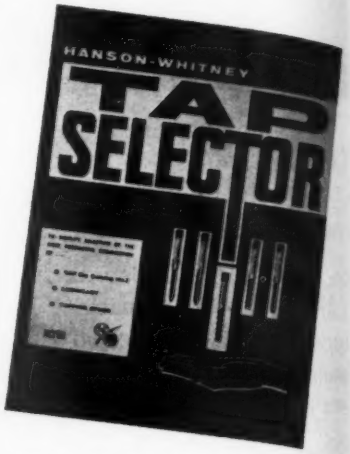
The new line of Walker-Turner light-heavyweight 17″ drill press equipment is extolled in a new brochure by Walker-Turner Div., Rockwell Mfg. Co. Circle Inform-A-Gram No. C9.

High precision automatic bar machines and accessories by American Bechler Corp. are the subject of a new brochure. Yours for circling Inform-A-Gram No. C10.

Planetary thread rolling machines covering thread rolling, roll forming, marking, serrating and necking of bolts, screws, nails and special parts in many sizes — all are described in a new catalog from Prutton Corp. For yours check Inform-A-Gram No. C11.

"Metal Spinning and Fabricating," via the exclusive Mecatorn process, is the title of a booklet from C. W. Torngren Co., Inc. For your copy circle C12.

A water soluble machining base is listed in a brochure from Baker-Gubbins Co. The base is said to sink aluminum chips and prevent caking of aluminum fines. It's also capable of increasing grinding wheel life. Check Inform-A-Gram No. C13.



Catalogued and numbered are more than 1200 different sizes and types of standard taps. All are available from stock of the Hanson-Whitney Co. For your 36-page tap selector list, check Inform-A-Gram No. C14.

Fluid Power Valves, (25 types) including the quick response low pressure drop headline models, are grouped in 3-way and 4-way types with various Ross solenoid and air operated heads, and by pipe sizes from ¼ to 1½″. Bulletin 323 by Ross Operating Valve Co., or Inform-A-Gram No. C15.

Circling Inform-A-Gram No. C16 will bring you Erickson Tool Co.'s new catalog on collet chucks and collets.

Insert bar stock between Locking Pin and Radius Pin of desired size.
Clamp tube. Insert Follow Block between material and Forming Roller.
1 OFF CENTER EYES
HOW TO BEND bars and tubing
TUBING 1
Set Forming Roller against material and advance Operating Arm.
2
Advance Operating Arm until it strikes Angle Stop. 2
Complete operation with one steady movement.
Remove Follow Block, release clamp and remove tube.
3
3
with a
DI-ACRO BENDER
Complete details on forming rods and tubing with standard accessories as well as tips and technical data on angle, channel and other materials will be found in "It's pronounced die-ack-ro
easy to bend", a 32 page summary of Di-Acro Benders and bending. A copy is yours free of charge.

di-acro PRECISION METALWORKING MACHINES

O'NEIL-IRWIN MFG. CO.

943 8th Avenue Lake City, Minn.

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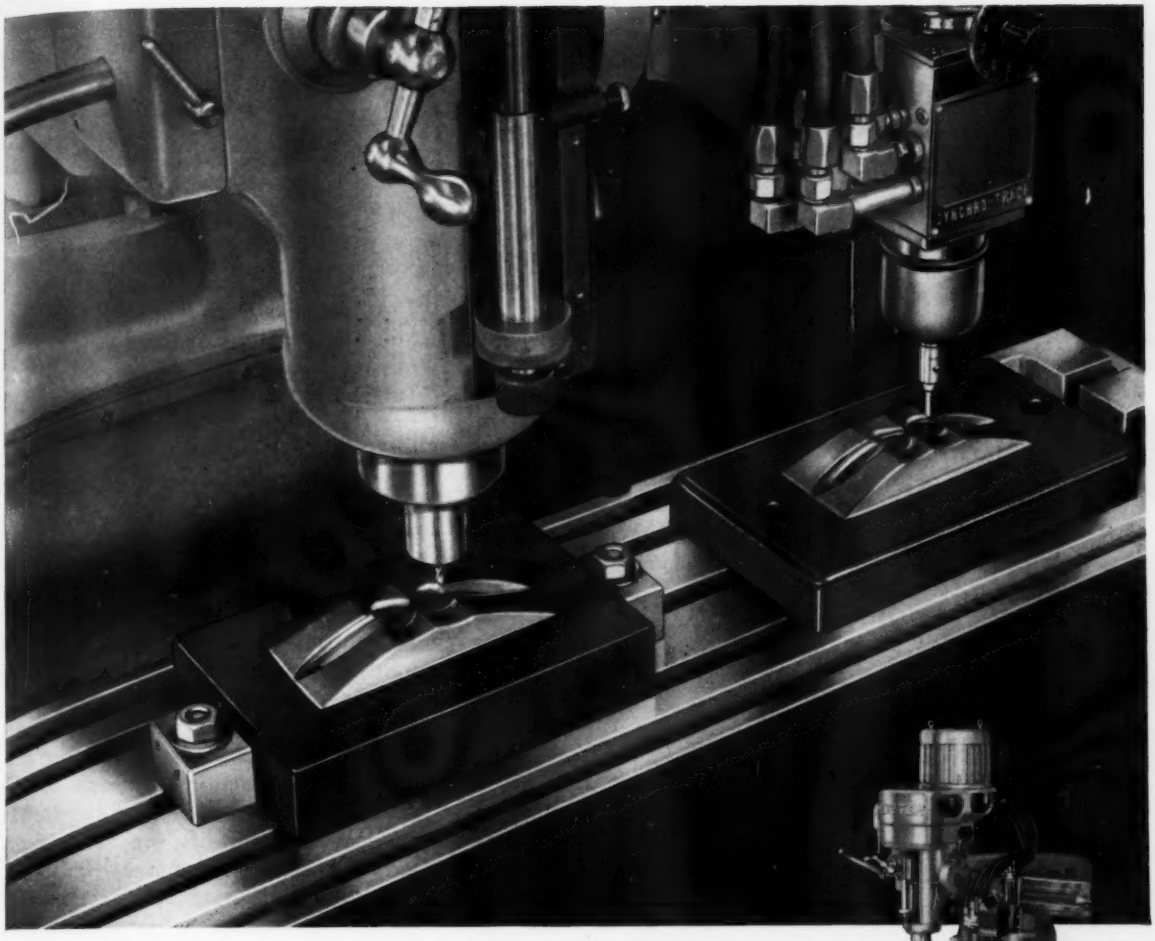
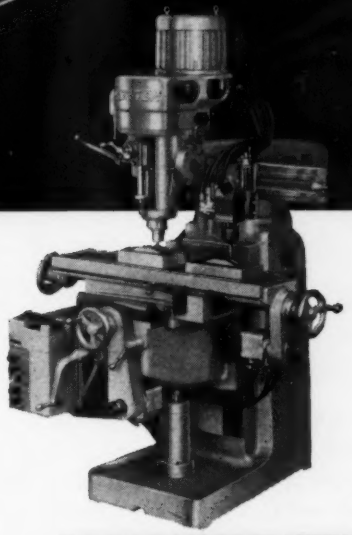


NEW AUTOMATIC DUPLICATOR

GORTON

Synchro-Trace Mastermil



Now . . . in response to metal-working needs, Gorton presents a fully automatic rise and fall duplicator, ideal for all types of dies and molds in ferrous and non-ferrous materials. Sensitivity and accuracy are combined in this rugged milling machine with versatility for power feed and hand feed milling operations . . . a duplicator to provide you with the simplest, fastest, most accurate way to make dies and molds.

Write for Bulletin 3095 for full particulars on Gorton Mastermil with Integrated Synchro-Trace or Contact Gorton Distrbutor in your area.

A GORTON PRODUCT, THE FINEST OF ITS KIND!

GORTON

SINCE 1893

GEORGE GORTON MACHINE CO.

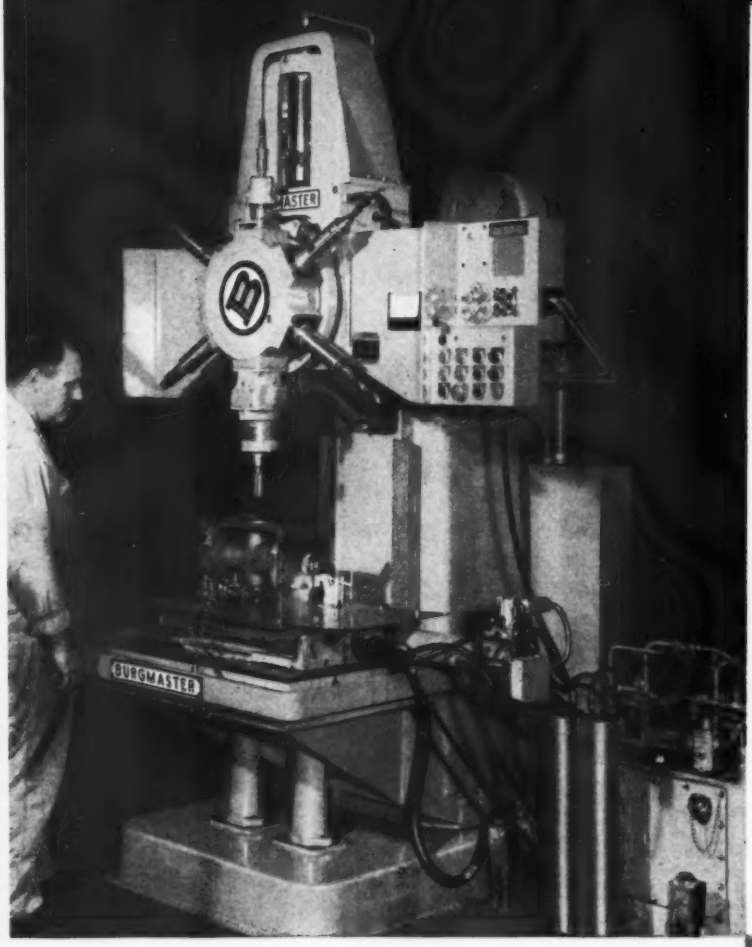
1203 RACINE STREET RACINE, WISCONSIN

Milling, Die Sinking, Profiling and Engraving Machines with Manual Hydraulic, Electro-Hydraulic or Numerical Guidance Systems. Special Machines and Automated Transfer or Indexing Machines. Cutting Tools and accessories...Defense and special products.

CIRCLE INFORM-A-GRAM KEY NO. 87

PRODUCTION OF HYDRAULIC CY

BURGMASTER 25AH AU



5% Rejects Eliminated

The Pearne & Lacy Machine Company, South El Monte, California use a Burgmaster Automatic Hydraulic 6-Spindle Turret Drill to machine cast steel high-pressure hydraulic cylinders. Formerly, on a single spindle drill, production was 12 cylinders per 8-hour shift, and averaged 5% rejects. Present production on the Burgmaster Turret Drill is 30 cylinders a shift—an increase of 150%, and rejects have been eliminated.

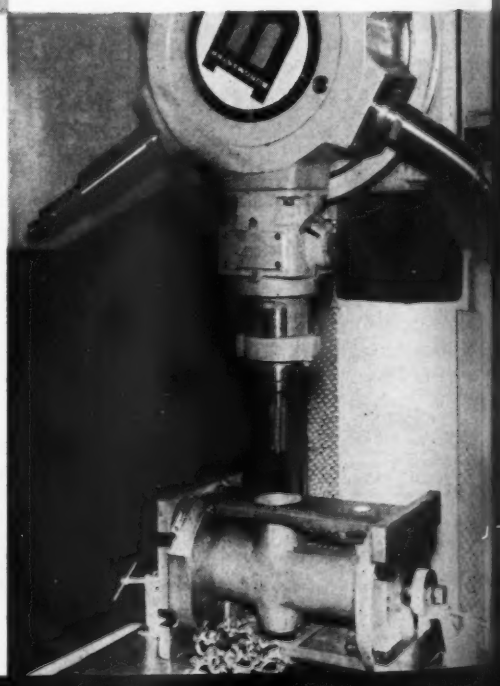
The Burgmaster Turret Drill holds close hole concentricities and dimensional tolerances by automatically performing up to six machining operations on each hole in one work position. Most efficient cutting action of each tool is assured by pre-selective feeds and speeds that shift as the turret automatically indexes, for finest finish and precision. All machine functions are automatic and completely adjustable to suit the character of the work. Burgmaster Turret Drills may be furnished as production-ready units, complete with fixtures and tools.

An Air-Operated Shuttle Fixture mounted on the Burgmaster Turret Drill shifts the work so that all operations on both cylinder holes are performed automatically. The operations include drilling, reaming, counterboring and tapping.

Class 3B Thread Rejects Eliminated with Burgmaster Lead Screw Tapping Head

The cast steel cylinders at Pearne & Lacy require burr-less 1⅛" UNF-3B threads, and accurate depth control of tap penetration in a flat bottomed hole. Formerly, on a drill press using ordinary tapping methods, a major source of the 5% rejects was defective threads. The Burgmaster Tapping Head with its positive lead, and close control of tap penetration, has eliminated faulty threads as well as broken taps due to bottoming.

The Burgmaster Lead Screw Tapping Head is available with quickly interchangeable lead screws for all NC, NF and pipe threads in the ⅛" to 1" range. Write for information on the complete line of Burgmaster Tapping Heads.



LIC CYLINDERS INCREASED 150%

AH Automatic Hydraulic Turret Drill

SEQUENCE OF MACHINING OPERATIONS

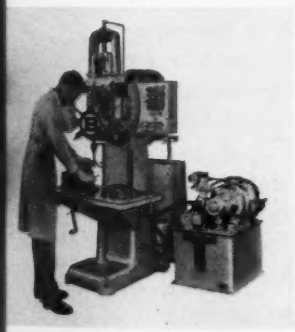
Spindle No.	Tool	Speed	Feed
1.	Drill 1"	230	.015
(shuttle fixture)			
2.	Drill 17/32	575	.008
3.	Pipe Tap 3/8" (Burgmaster Positive Drive Tapping Head)	200	
(shuttle fixture)			
4.	Rough C'bore 1.600, ream 1-1/32	230	.012
5.	Pilot ream 1.625 ±.001	275	.010
6.	Tap 1⅛-12 UNF-3B (Burgmaster Lead Screw Tapping Head)	115	

JOB FACTS

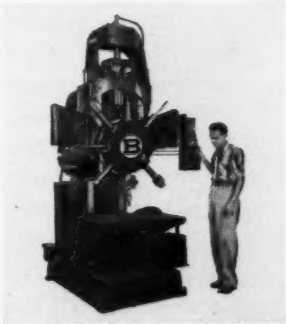
Cast 4130 Steel Steel Cylinder After Machining

Company:	Pearne & Lacy Machine Co., South El Monte, Calif.
Machine:	Burgmaster 25AH Automatic Hydraulic Turret Drill
Machine Accessories:	Burgmaster Lead Screw Tapper. Burgmaster Positive Drive Tapper.
Part:	Cast steel high-pressure hydraulic cylinder.
Fixture:	Automatic shuttle; 180° hand indexing
Tools:	H. S. S. and include two special counterbores.
Former Method:	Drill press.
Former Time:	12 parts/8-hr. shift
Present Time:	30 parts/8-hr. shift.
Production Increase:	150%
Other Advantages:	Former average of 5% rejects eliminated—Better quality threads—Improvement of product quality—Firmer production schedules–Less Operator fatigue.

Other Burgmaster Automatic Hydraulic Turret Drills



Model 2BH—¾" Drill and Tap Capacity in Steel



Model 3BH—1 ½" Drill and Tap Capacity in Steel

Write for Bulletin describing Burgmaster 6 and 8 Spindle Automatic Turret Drills in detail. Forty minute 16mm sound film showing Burgmaster turret drills in action, including tape controlled models, is available without charge from any Burgmaster representative.

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dealer representatives in other industrial centers.

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World's Largest Builder of Turret Drilling Machines

"O" Manual Power Index ¼" Capacity

1C Manual Power Index ⅜" Capacity

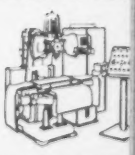
2B Manual Power Index ¾" Capacity

2BR Ram Type Radial Drill ¾" Capacity

2BH Automatic Hydraul ¾" Capacity

3BH Automatic Hydraul 1½" Capacity

25AH Automatic Tap Controlled 1¼" Capac



2BHT-3BHT Automat Tape Controlled ¾" and 1½" Capaci

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with ASA Symbols

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Detroit 37

CIRCLE INFORM-A-GRAM KEY NO. 90

Catalogs . . .

Machine tool and industrial hydraulics are treated in new Catalog EJS released by John S. Barnes Corp. Request it by circling Inform-A-Gram No. C17.

"Electroplating Processes" is the name of 24-page Bulletin EY-102 issued by Hanson-Van Winkle-Munning Corp. It's free if you circle Inform-A-Gram No. C18.

Bulletin TD-60 published by Landis Tool Co. is devoted to the company's Truform Dresser for grinding wheels. Circle Inform-A-Gram No. C19 for a free copy.

A new layout drilling machine performs drilling, boring, reaming and tapping operations at maximum speeds and feeds. Read about it in Catalog 160 by Jackson-Fotch Co. Inform-A-Gram No. C20.

By checking Inform-A-Gram No. C21 you will receive Catalog NA-3 which deals with Norgren Company's new line of compact pneumatic products.

Air Operated Cam Contouring Machine Model 41, by Olofsson Corp., is technically described and charted in a color bulletin. If interested mark No. C22.

Drive studs and solid "Groov-Pins" are illustrated and technically described in a new brochure by Groov-Pin Corp. Fast and easy engineering reference is the highlight. Inform-A-Gram No. C23.

Benches, bins, cabinets, shelving, stock carts and special accessory equipment are catalogued by Bay Products, Inc. For your free copy check Inform-A-Gram C24.

Ram type and saddle type turret lathes, five models, offering collet capacities from 1 to 5", are explained in a new brochure by Bardons & Oliver, Inc. If interested circle No. C25.

New industrial lubricant called "Lubri-Cool" is the subject of a brochure issued by Lord Laboratories. For your free copy circle Inform-A-Gram No. C26.

The ball bearing units made by Stephans-Adamson Mfg. Co., are discussed in the company's new Catalog 454. The publication will be sent free if you circle Inform-A-Gram No. C27.

Ultra-Reliable Systems for high speed process monitoring, production testing, and automatic checkout are the subject of a bulletin by Monitor Systems, Inc. Check Inform-A-Gram No. C28.

A lease plan for industrial lighting offered by Westinghouse Electric Corp. is the topic of Booklet SA-8865 published by the firm. Circle Inform-A-Gram No. 29 for your copy.

Catalog 318 from Taft-Pierce Mfg. Co. describes the firm's surface grinders and lapping machines, and the many accessories that go with them. Circle Inform-A-Gram No. C30.

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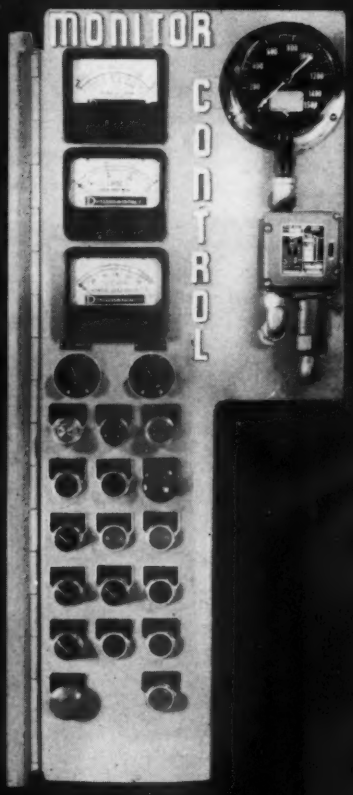
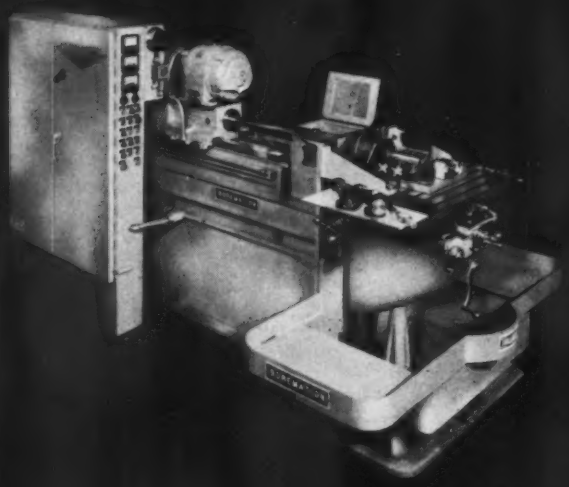
NEW

THE BOREMATION MONITOR



MONITOR Control



"MONITOR CONTROL" or MC is an exclusive electronic system developed by DRILLMATION to remove all guesswork from Gun-Drilling.

Since all Gun-Drilling dangers occur inside the hole during the drilling cycle — it is impossible for the operator to detect a malfunction until it is too late to save the workpiece or tool.

In case of trouble, the MC automatically takes control of the machine and stops the feed, until the problem can be corrected.

BOREMATION MC Gun-type Drilling is the only "true" foolproof method of drilling Deep-Holes.

MC is so simple — any machinist will become a Gun-Drilling expert in hours — **Specialists are not required.**

6507 E. ELEVEN MILE RD. • CENTERLINE, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 92

Catalogs . . .

Tracing templates, full scale, for use by jig, fixture, and special machinery manufacturers, are available from Northwestern Tools, Inc. The set includes more than 200 components most often used. Inform-A-Gram No. C31.

Tooling & Production erred in January in reporting the price of two technical board reports available from the National Fluid Power Assn. The publications—"Glossary of Terms for Fluid Power, Second Edition—1960," and "Dimension Identification Code for Fluid Power Cylinders" — cost $1.00 each, not 50 cents. Quantity prices are available from the association at 5595 N. Hollywood Ave., Milwaukee 17, Wis.

Wall charts show distinctive traits of the Oxy-LP gas flame, compared to oxy-acetylene flame. The charts are 11 x 17", fold to 8½ x 11" to fit standard catalogs. Suitable for training education, the charts are available from Smith Welding Equipment Co., or circle Inform-A-Gram No. C32.

Poly-V Drive, V-Belts, transmission belts, conveyor belts, and all types of hose, flexible rubber pipe and expansion joints, plus a summary of molded and extruded products, are outlined in a catalog from Manhattan Rubber Div. of Raybestos-Manhattan, Inc. Circle Inform-A-Gram No. C33.

"REN Techn-Ni-Tips/Tooling Digest" is a new bi-monthly publication available from REN Plastics, Inc. Meat of the articles will be the technique of using epoxy plastic materials in tooling, master model and pattern making. Inform-A-Gram No. C34.

Micro miniature end mills, by Woodson Tool Co. are described and priced in a new catalog. Circle Inform-A-Gram No. C35 for your copy.

General purpose and production bars for line and stub boring are the subject of a catalog by Giddings & Lewis Machine Tool Co. Also listed are continuous feed heads for boring, facing, grooving, counterboring and backfacing holes from 7/16 to 25" dia. For copy, circle Inform-A-Gram No. C36.

High precision Ultraron rotary tables are described, specified, and documented in catalog UR-200 from AA Gage Co. Circle Inform-A-Gram No. C37 for your copy.

Removal of Rust from raw stock, and prevention of hydrogen embrittlement during rust removal through alkaline de-rusting agents, are covered in Bulletin 16B. Simultaneous removal of rust and grease, and many other procedures are also detailed by Oakite Products, Inc., check No. C38.

PHONE, WIRE, WRITE—That's how to put words into action! Start the job . . . complete it! If it concerns Carbide Dies *or ultra-precision components,* we want your inquiry. You'll get a trigger-fast reply! Delay could cost BIG money, waste time! Know the make, capacity and type of press you'll use; stroke and die space over its bolster; part prints showing radii and *all* tolerances; gauge and type of material coiled or strip to be run. With this information, we can quote you intelligently and fast. You'll like Oberg service.

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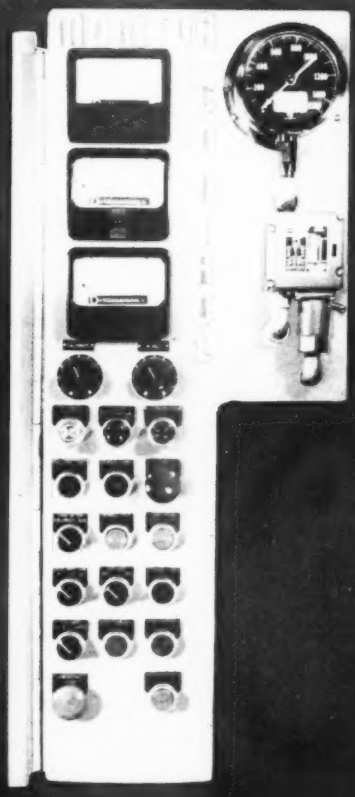
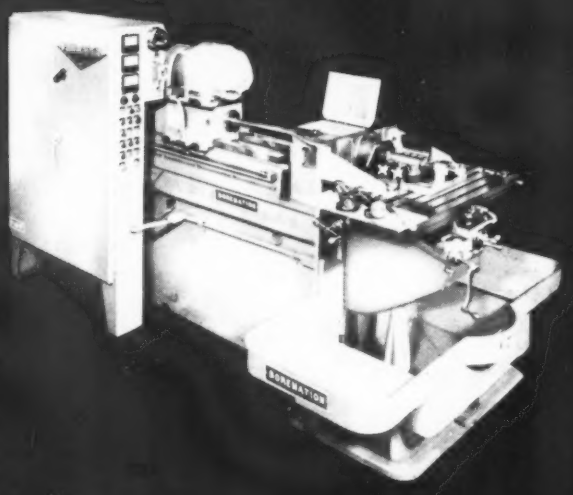
STOPS BROKEN DRILLS
ELIMINATES SCRAP . . .

. . . and makes everyone a gun-drilling expert



MONITOR Control



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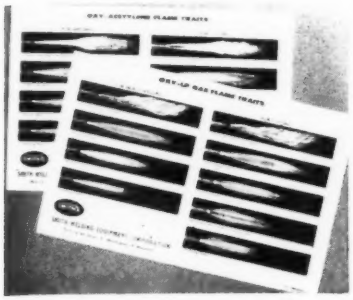

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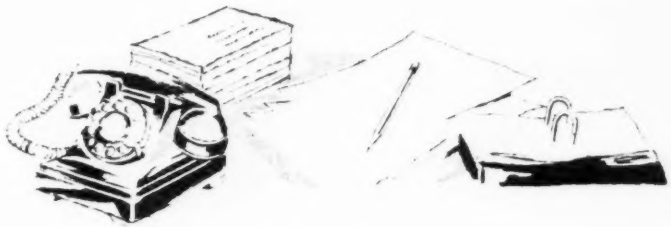

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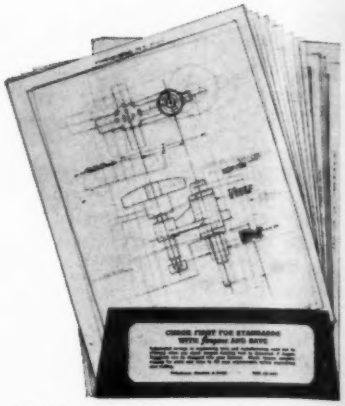
Catalogs . . .

Cincinnati arbors and accessories are presented attractively in a new catalog M-2029 by Cincinnati Milling Machine Co. Get your copy by circling Inform-A-Gram No. C39.

Circular form tools and blanks for use in automatic screw machines, are described in a catalog published by Somma Tool Co., Inc. Also included is complete range of cutoff blanks. C40.

Solvent vapor recovery system cuts degreasing and cleaning costs, and is described in a brochure by Industrial Division of Vic Mfg. Co. The company has application histories on file. Inform-A-Gram No. C41.

Gearmotors from 1 to 150 hp, AC, single, double, and triple reduction, and Line-O-Drivers from 1 to 75 hp, are described and illustrated in a brochure from Howell Electric Motors Co. Inform-A-Gram No. C42.



Full size tracing templates are offered free to jig and fixture components manufacturers, tool designers, and draftsmen by Jergens Tool Specialty Co. Circle Inform-A-Gram No. C43.

"Ball Bearing Screws and Spline Operation," is the title of the 1961 engineering data book from Actuator Operation, Saginaw Steering Gear Div., General Motors Corp. This valuable aid in solving actuation problems is yours by circling Inform-A-Gram No. C44.

Hydraulic power units (37 models) are illustrated in Bulletin 0980-B1 by Hannifin Co., Div. Parker Hannifin Corp. Inform-A-Gram No. C45.

"Souvenir of the Semi-Centennial," is the title of Wheel Trueing Tool Co.'s history of a half century of diamonds in industry. Interested? Circle No. C46.

"Metal Stampings in Small Lots," is the name of a bulletin from Dayton Rogers Mfg. Co. A chapter headed "Suggested Basic Designs," should be of interest. Inform-A-Gram No. C47.

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GAP OR COLUMN TYPES
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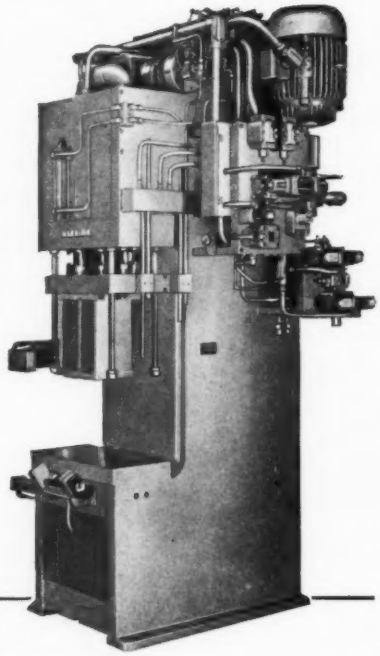

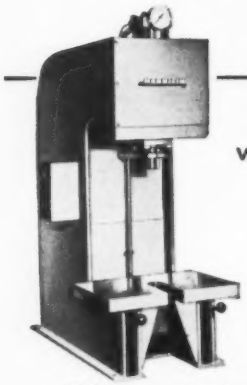

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PNEUMATIC AND HYDRAULIC SYSTEM COMPONENTS

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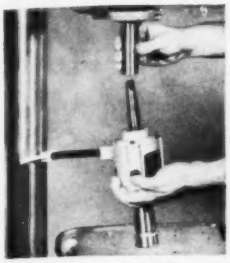
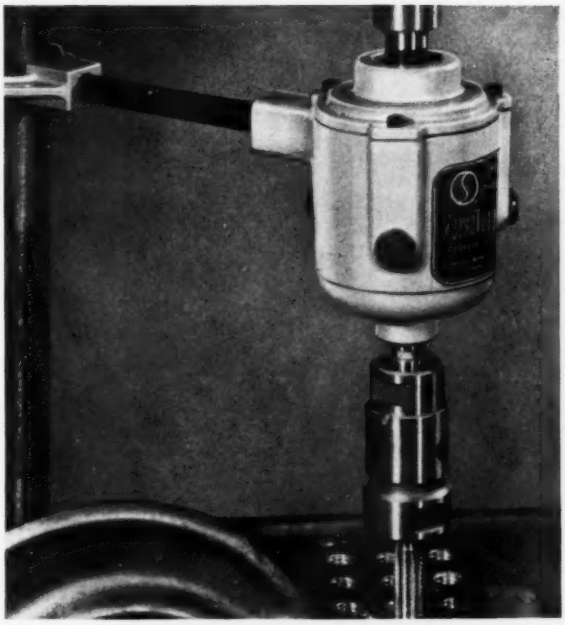
iT'S A FACT!

You can tap 1/2" holes with a light drill press and Supreme's New VersaTAPPER



Shaft of Model 6100 is held in drill press chuck. No. 6200 (above) has Tapered spindle.

Supreme Accutap Chuck is standard equipment with VersaTAPPER. Capacity 0-½"



VersaTAPPER is a compact precision-made tapping unit. Fits any drill press... features 0 to ½" capacity range plus 4-time increase in torque. Easy to install. Simple and quick to remove after use.

VersaTAPPER... operates easily in any material ...with widest capacity range ...yet costs far less

JUST $63 COMPLETE

The *new* VersaTAPPER has scored an instant success with production people everywhere. It has more versatility than other tapping devices. It has the *widest capacity range*—from 0 to ½". It develops *more power*—makes the tapping of ½"-13 holes a simpler matter, even with light duty drill presses. VersaTAPPER is *simple to use*—can be successfully operated by anyone in your shop.

All of these features at the remarkably low price of $63 complete marks VersaTAPPER as a product you must see at the first opportunity. It's available at your local Supreme Chuck distributor. Call him soon. Also check number on the reply card in this magazine for literature.

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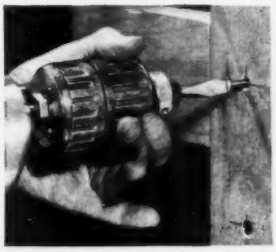
You get more from power tools with Top Quality Supreme Accessories

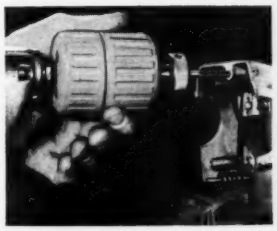
Supreme Brand Chucks

Noted for unmatched quality. The widest range of sizes and types...one for every machine in your shop. Exclusive Supreme hardening means greater accuracy—longer wear.



Supreme Versamatic

Reversible speed reducer for portable drills. Fits all makes—permits their use for power screw driving, nut running and heavy duty drilling. 7 to 1 reduction means high torque increase. *A fine tool.*



Supreme Push-Pull Tapper

Like the Versamatic, but made for the single purpose of tapping with portable drills. Reverses instantly for tap removal. Handles taps up to 5/16" diameter. Top quality. Simple to operate.

SUPREME PRODUCTS ARE IN STOCK IN YOUR CITY. CALL YOUR DISTRIBUTOR

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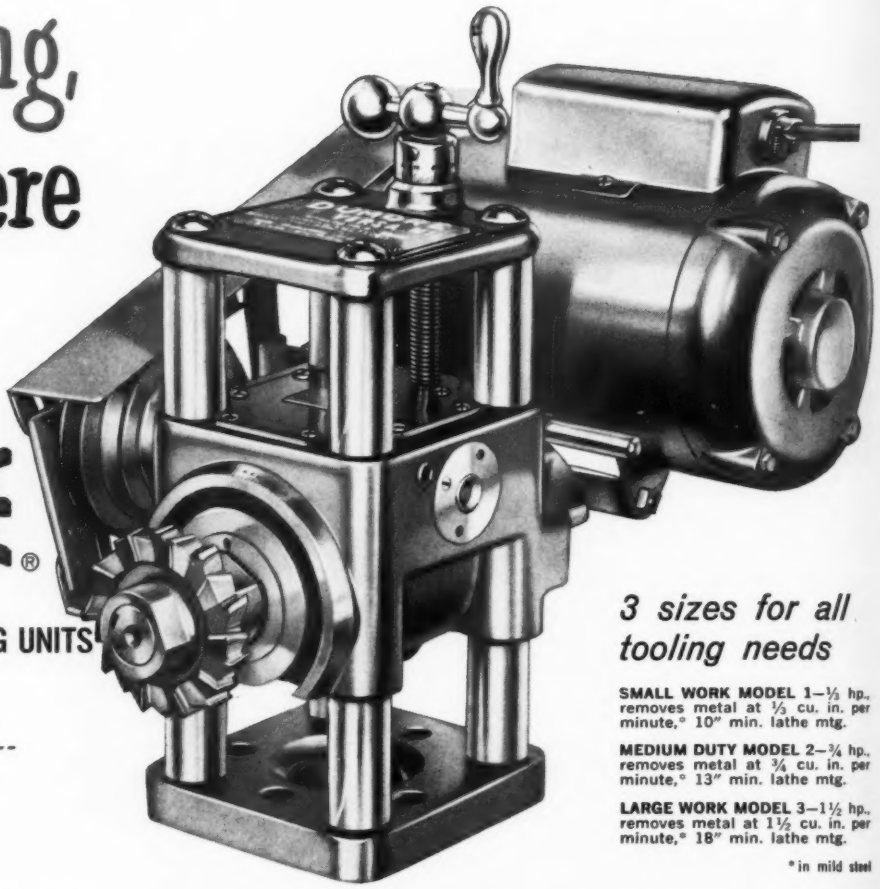
machine anything, anywhere

with

DUMORE® VERSA-MIL

PORTABLE MACHINING UNITS

GIANTS FOR WORK--
yet move easily from job to job



3 sizes for all tooling needs

SMALL WORK MODEL 1—⅓ hp., removes metal at ⅓ cu. in. per minute,* 10" min. lathe mtg.

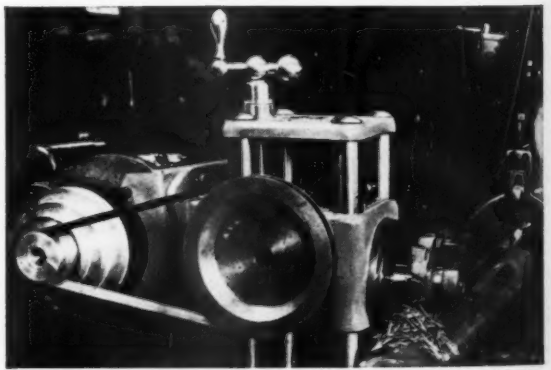
MEDIUM DUTY MODEL 2—¾ hp., removes metal at ¾ cu. in. per minute,* 13" min. lathe mtg.

LARGE WORK MODEL 3—1½ hp., removes metal at 1½ cu. in. per minute,* 18" min. lathe mtg.

*in mild steel

***MILL • BORE • SHAPE • SLOT • GRIND • DRILL** at lower cost*

Compact, rigid, portable units in three sizes. Perform in any position. Built-in power and feeds. Use independently or attach to machine tools for secondary operations. Save handling, moving, set-up and down-time. Also machine in-place parts too big for standard tools. One unit often pays for itself on one job. Provide close tolerance quality at **profitable** metal removal rates. Give **you** the advantage of machining where it is most economical!



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Feed Tables • Drill Heads • Micro-Drills
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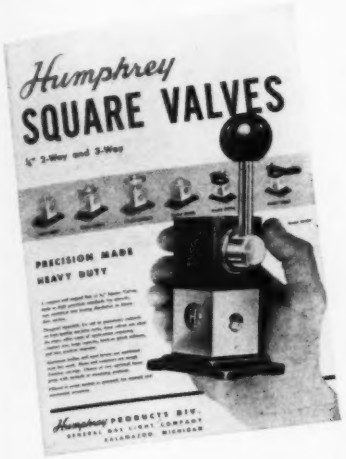
CIRCLE INFORM-A-GRAM KEY NO. 96

Catalogs . . .

"Progress in Arc Welded Design," is a booklet dealing with the $25,000 award program sponsored by the James F. Lincoln Arc Welding Foundation, Cleveland, Ohio. Inform-A-Gram No. C48.



Engineering data on square body control valves are given in a new catalog from Humphrey Products Div., General Gas Light Co., Kalamazoo, Mich. Inform-A-Gram No. C49.

Drilling machines and surface grinders by Foote-Burt Co., Footburt-Hammond radial drilling machine, the Footburt-Hammond surface grinding machine and Footburt-Sipp sensitive drills, are all in a new catalog. Circle Inform-A-Gram No. C50.

Wide inner ring ball bearings that can be mounted on straight shafts and positioned without shoulders, locknuts or adapters, are the subject of a 60-page catalog from the Fafnir Bearing Co. Inform-A-Gram No. C51.

"Rapidset," the all purpose vise for tool room and machine shop, is illustrated and specified in a bulletin from Harig Mfg. Co. Also included is "Jawset," Harig's adjustable pressure vise. Inform-A-Gram No. C52.

Drill presses, grinders, shapers, planers, jointers, and metal and wood cutting lathes are listed and specified in a 92-page catalog from Rockwell Mfg. Co., free on Inform-A-Gram No. C53.

Standard and special press brake dies, plus tonnage requirement tables for punching and bending various thicknesses of mild sheet steel, are outlined in a new catalog from Valeron Corp.'s Press Brake Div. Inform-A-Gram No. C54.

Push-button automatic reset dial timer, series 309 is illustrated and specified in a bulletin from Automatic Timing & Controls, Inc. It can control the cycles of lapping or tumbling machines, for instance. Circle Inform-A-Gram No. C55.

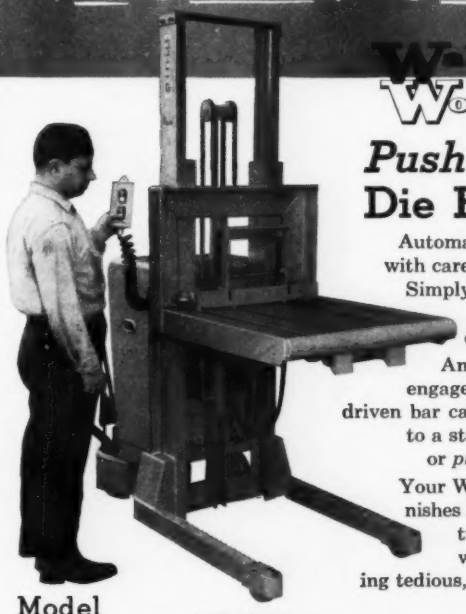
Numerically controlled horizontal die sinking and contour milling machines are described in a new 12-page Catalog DM-115 issued by Giddings & Lewis Machine Tool Co. Circle Inform-A-Gram No. C56.

Information on Replacement of small-bore heavy section standard bearings, with 4 to 40" bore thin-section bearings, is included in the new Reali-Slim Bearing Bulletin S-109 by Kaydon Engineering Corp. Inform-A-Gram No. C57.

PUSH, PULL
-Quick, Quick!-

Walkie® Worklifter

Push Button
Die Handler



Automatically handle costly dies with care—no danger, no damage. Simply press a button and your die platform rises to any desired height up to 120".

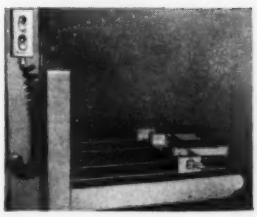
Another finger tip operation engages the die bar. This power driven bar carefully *pushes* the die on to a storage rack or press bed—or *pulls* it off—automatically.

Your Walkie-Worklifter also furnishes automatic *"touch and go"* transportation of die loads within the plant, eliminating tedious, risky lifting and hauling.

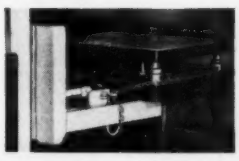
Model WWLDT Data

Capacity: 2000 lbs.
Lifts: 60, 80, 96, 110 and 120"
Platform: 30 x 30"
Power: Industrial battery automatic rectifier charger

PUSH



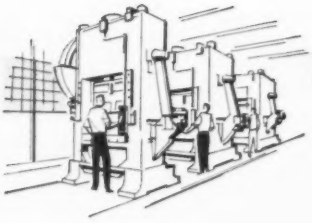
PULL



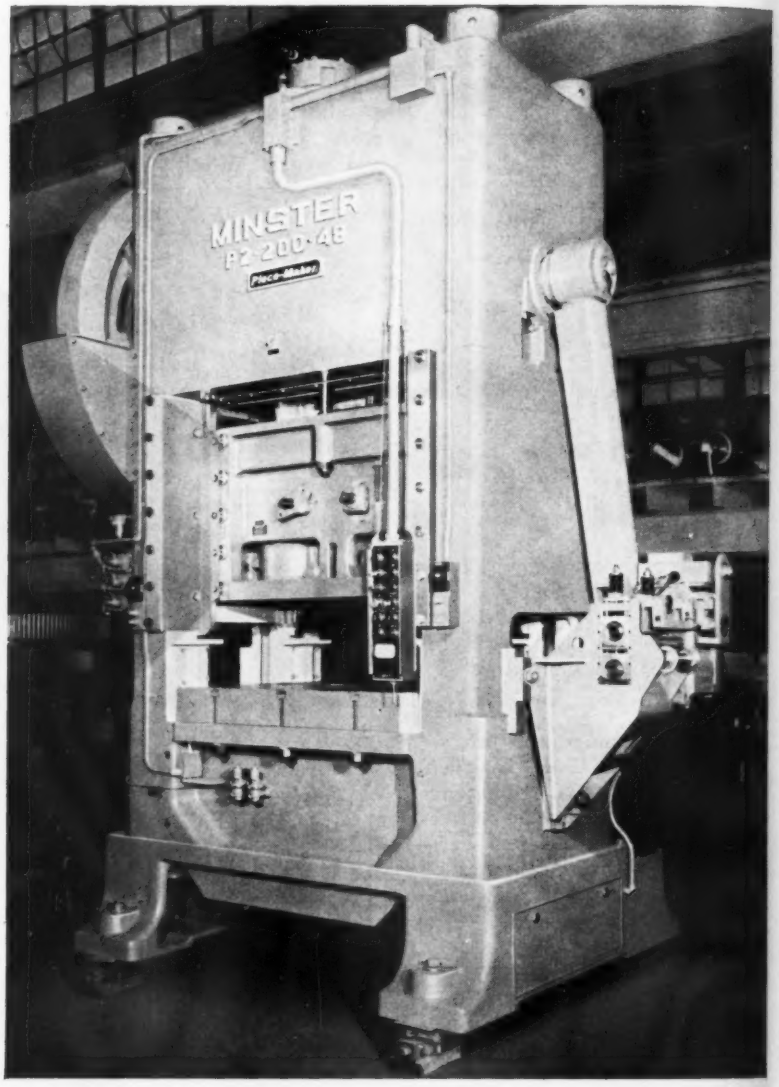
Write for full information. Everything for die handling from inexpensive lifters to complete, automated systems.

ECONOMY ENGINEERING 4509 W. Lake St., Chicago 24, Ill.

CIRCLE INFORM-A-GRAM KEY NO. 97



ANOTHER SATISFIED USER



LAMINA-BRONZE WEAR PLATES

Lamina
DIES AND TOOLS, INC.
P.O. BOX 31, ROYAL OAK, MICHIGAN
Phone JOrdan 4-8711

Lamina-Bronze Wear Plates and their use are more completely described in Bulletin WP-59, send for your free copy.

The adjustable slide ways of this Minster press utilize Lamina-Bronze (electroplated bronze on steel) Wear Plates to assure long-life and free-running. In like manner, Lamina-Bronze wear surfaces are the best answer for any part that requires the non-seizing properties of bronze and the strength of steel.

CIRCLE INFORM-A-GRAM KEY NO. 98

IT'S A FACT!

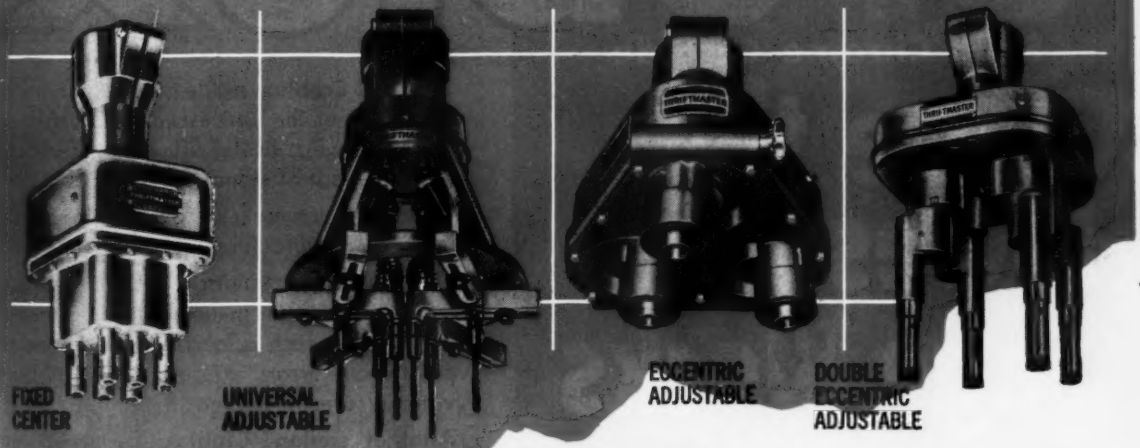
DRILLHEADS
ARE OBVIOUS.

Tremendous economies from the use of multiple-spindle drillheads are obvious. Drilling one hole at a time cannot be tolerated in this day of automation!

THOMSON
THRIFTMASTER
Drillheads
are your best Drillhead buy...

1. They are better built and cost no more (Full ball bearing construction, hardened gears, spindles and driver, and precision grinding!)
2. This means they last longer
3. This eliminates down time
4. This eliminates production losses
5. This drastically reduces drilling costs

THOMSON
THRIFTMASTER
Drillheads are designed and produced by engineers whose experience in **this specific field** dates back to 1923. This long accumulation of engineering technique and production "know-how" is reflected in our product—**a quality tool... solid, substantial and dependable!**



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REAM • BORE
COUNTER-BORE
COUNTER-SINK
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makers of BALL BUSHINGS • NYLINERS • 60 Case Shafting

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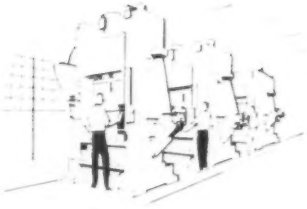
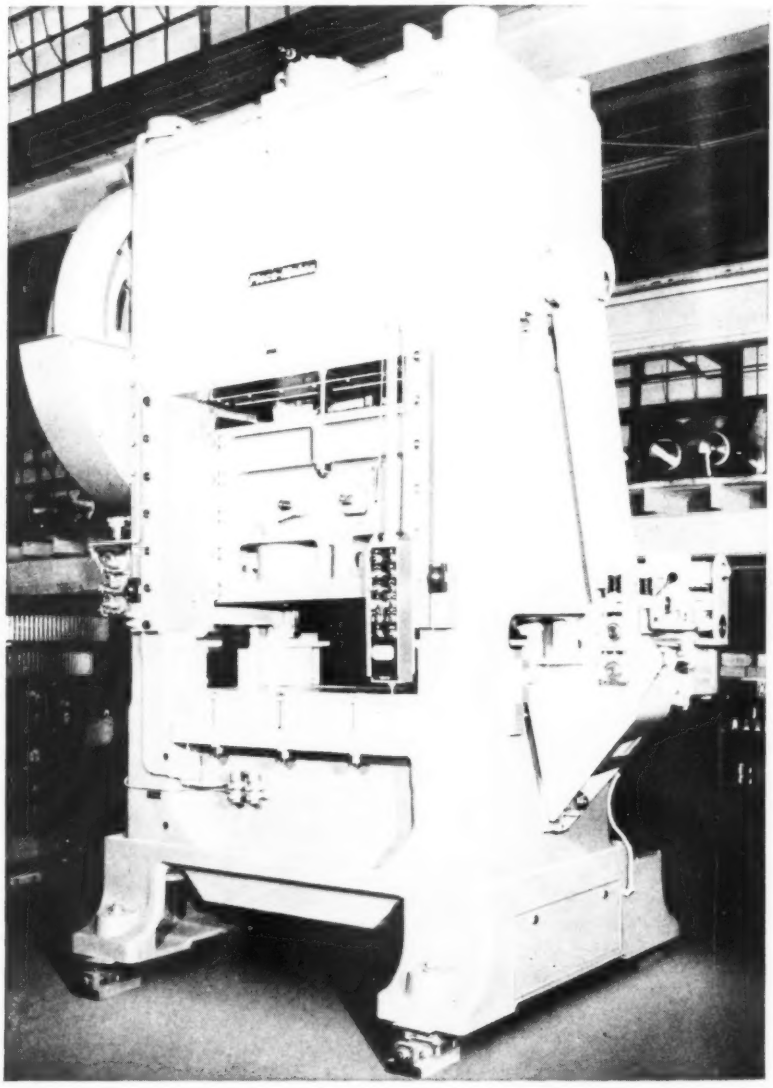


ANOTHER SATISFIED USER



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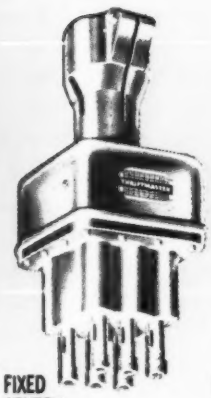
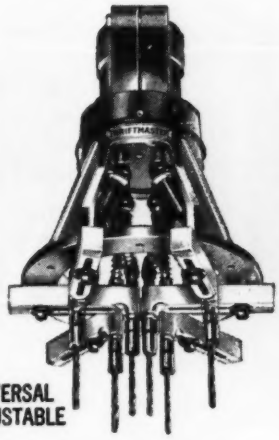
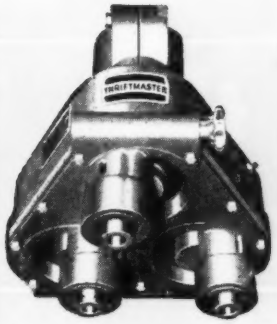
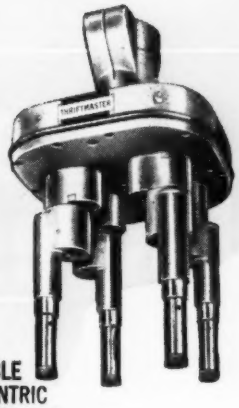

FIXED CENTER


UNIVERSAL ADJUSTABLE


ECCENTRIC ADJUSTABLE


DOUBLE ECCENTRIC ADJUSTABLE

DRILL • TAP
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Rectangular or square
Grade A+ Croblox +.00004", −.00002"
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(rectangular only)

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Solid Chrome Carbide

are the lowest cost Gage Blocks

—based on the many extra years of service they give.

WEBBER Croblox, made of solid chrome carbide, one of the hardest metallic substances known, have a useful life expectancy up to 70 times that of standard steel blocks.

This fact alone makes Croblox a great money saver for manufacturers of precision products.

There is another saving — Webber Croblox, calibrated in split millionths, retain their accuracy over such a long period of time that production errors caused by worn blocks virtually are eliminated.

Another saving. Croblox, being 30 times more corrosion resistant than 18-8 stainless steel are not affected by moisture, finger prints, body or airborne acids, all of which can affect the accuracy and wringability of steel blocks.

Your inquiries are invited.

We also manufacture a full line of rectangular and square Steel Gage Blocks.

Webber GAGE COMPANY

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Telephone CL. 1-1200

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LOW PRICES: WRITE
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BBF Precision Grinding (BBFPG) resharpens dull machine/hand files to New File Efficiency, without affecting temper, cut or hardness. We solicit your interest.
B. B. Feldenfeld Co., est. 1939 Beaver Falls, Pa. Salesmen wanted. All territories. Repeat business

MINIATURE DRILL BUSHINGS
Hole Sizes—No. 80 to 3/32"
O.D. 3/32" to 13/64"
Lengths 1/4" to 3"
.0002 Tolerance on I.D.
O.D., and Concentricity
Specials to your specifications
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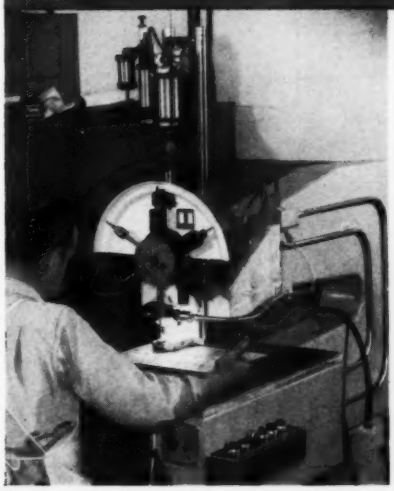
PREBCO BUSHING CO.
14714 East Arrow Hwy., Baldwin Park, Cal.

CIRCLE INFORM-A-GRAM KEY NO. 1011

PRODUCE 5 TIMES MORE PARTS
BURGMASTER Automatic 6-Spindle Turret Drill



● Shot pin fixture locator is shown projecting through table directly under the spindle. Color paths painted on template correspond to colors on spindle tooling as a visual aid for operation sequence.

Power Feed and Power Indexed Turret Speed Machining

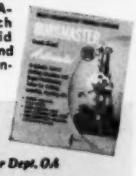
● Meridian Metalcraft, Whittier, California, use a Burgmaster Automatic 6-spindle Turret Drill to machine several designs of Heat Exchangers for Instruments. In the setup shown, 60 holes in a range of three diameters are drilled and tapped in six minutes—five times faster than with former drill press methods. The simpler setup also saves 40% in tooling.

● Special mounting of the Turret Head on a Riveter C-frame provides 45" throat depth for widest utilization of this efficient setup. Bushings in the fixture bottom duplicate the hole pattern, and are sequentially engaged by an air-operated shot pin located in the table directly under the spindle. After hand shifting the fixture to approximate position (±1/16") as indicated by the template, the operator presses a hand-held control button to seat the shot pin and bring the fixture to exact position. The safely seated shot pin automatically initiates the spindle power feed cycle.

Sequence of Operations

Spindle Number	Color Code	Tool	Speed
1	Red	Drill for #4-40 tap	1700
2	Black	Drill for #8-30 tap	1700
3	Green	Drill for #10-32 tap	1700
4	Red	Tap #4-40	900
5	Black	Tap #8-30	900
6	Green	Tap #10-32	900

● **WRITE FOR FREE LITERATURE** on Burgmaster Bench Model Turret Drills and Rapid Positioning Table. 1/4" drill and tap capacity in steel. Representatives in principal cities.



BURGMASTER CORPORATION
SMALL TOOL DIVISION—BURG TOOL MANUFACTURING CO., INC.
15001 S. Figueroa St., Box 311, Gardena, Calif. • Phone: FAculty 1-3510—Phone, wire or write Dept. OA
World's largest manufacturer of turret-type drilling and tapping machines.

CIRCLE INFORM-A-GRAM KEY NO. 1012

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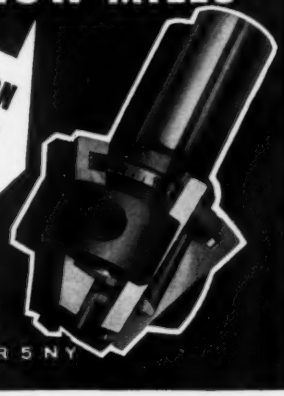
ADJUSTABLE HOLLOW MILLS

- Any COMBINATION of . . . Turning . . . Tapering . . . Facing . . . Chamfering . . . Trepanning in ONE PASS.
- Exclusive MICROMETER Adjustment Feature For Rapid Set-Up.
- Area Sales engineers for your immediate Problems.

WRITE FOR CATALOG 20 TP

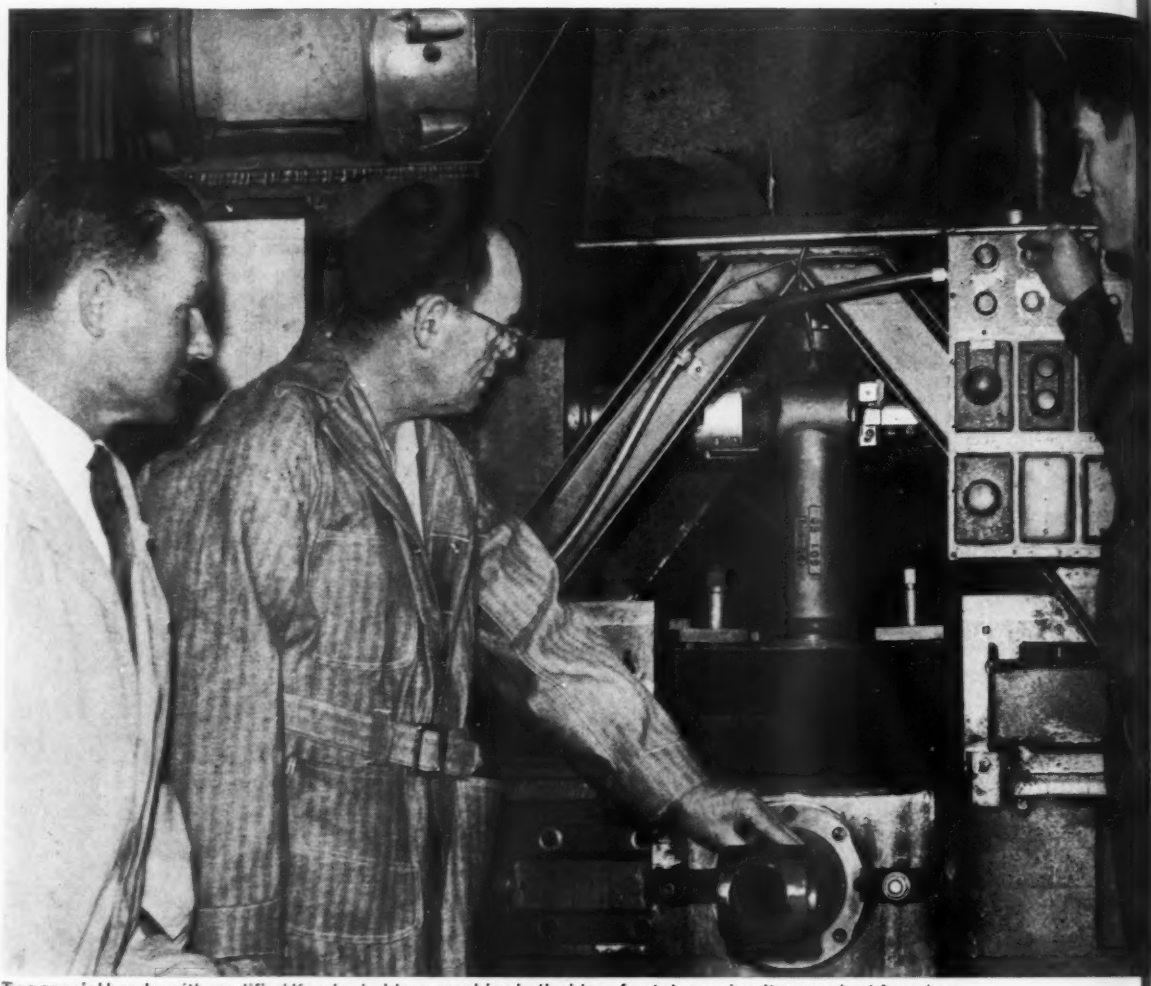
PRECISION STARTS HERE



CARL WIRTH & SON, INC.
1625 CLINTON AVE. NO. ROCHESTER 5 NY

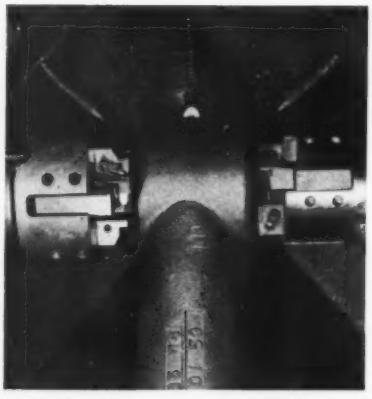
CIRCLE INFORM-A-GRAM KEY NO. 1013

KENDEX* *tailored* TOOLING



Two special heads, with modified Kendex holders, machine both sides of a stub eye simultaneously at American Coleman Company, Littleton, Colorado. Range of bore sizes can be machined by simply resetting tools.

*Trademark



Developed in cooperation with customer's engineers, the two special Kendex boring heads—with Kendex "throwaway" inserts—have increased production, reduced cost per piece and improved the product.

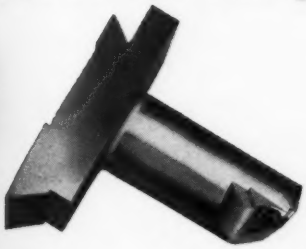
REASONS: Reduced initial set-up time from 3 hours to 30 minutes; eliminated the 5-hour tool regrinding job required after every 80 pieces. Instead of 3-hour set-ups, cutting edges are now indexed within ±.001 inch in 5 minutes. Saved—a full day's machine time for every 100 pieces.

Such IMAGINATIVE attacks on machining costs with Kendex Tailored Tooling are helping fight high costs in many plants. Applications shown at right may suggest operations in your plant where specially-designed Kendex tooling may combine two or more operations in one pass or help reduce machining costs in some other way.

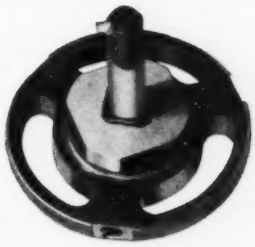
Kennametal Carbide Engineers, trained to analyze tooling applications and backed by our headquarters staff of tooling specialists, are continually helping customers use standard tooling or design special tooling to reduce machine downtime and improve production. To meet the growing demand for Kendex Tailored Tooling, our production facilities have been expanded repeatedly within the last several years.

For full details about the Kendex Tailored Tools shown at right, plus many more, call your Kennametal Carbide Engineer. Ask him for our booklet "There's Profit in Retiring a Tradition" which gives dollars-and-cents facts as to how some companies have reduced machining costs as much as 70% with standard Kendex "throwaway" insert tooling . . . or write to KENNAMETAL INC., Latrobe, Pa. 33581

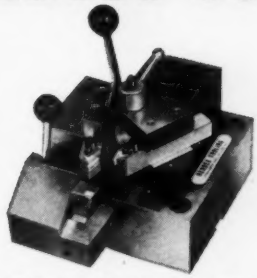
increases production...reduces cost



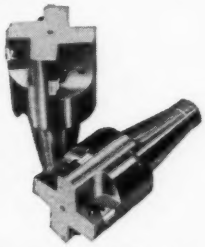
Boring Bar designed for mounting directly on machine tool turret in a gang tooling application. Dovetail mounting permits quick change of bore size.



Special K-Bar used for machining transmission cover. Design utilizes threaded construction to allow removal of solid carbide bar from flange.

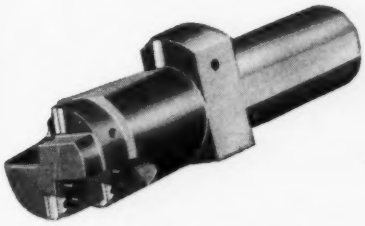


Special Facing, Skiving and Grooving Tool Block (rear slide) for machining transmission gear.



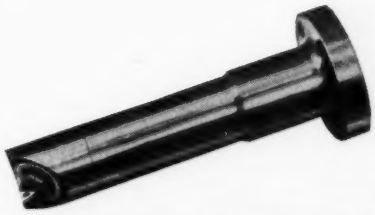
Special Milling Head for milling wrench slots (two flats for spanner wrench) on drill pipe.

Multi-Screw-On Kendex for machining rough throws on large crankshaft.

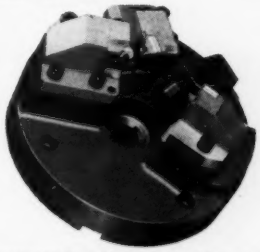


Special Multiple Insert Boring Bar with air coolant holes. Bores three diameters simultaneously.

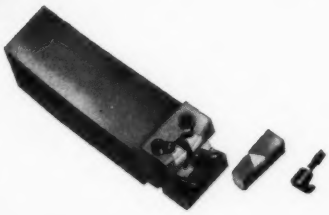
K-Bar for tracing complex deep hole. High rigidity of Kennametal shank eliminates chatter.



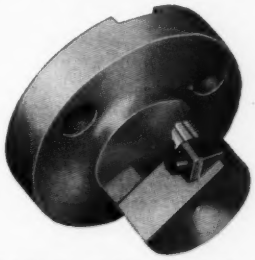
Special K-Bar with adjustable head for machining axle cross bores in differential carrier.



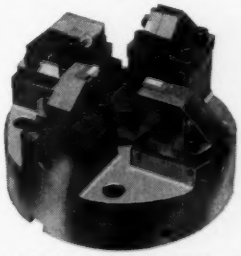
Special Hollow Milling Head for rough turning O.D. of bearing diameters, forming radius and chamfering of diesel tractor roller idlers.



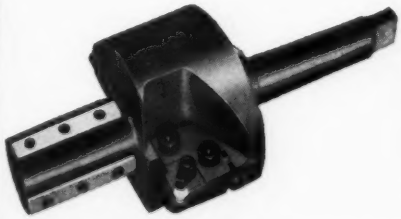
Multiple Insert Kendex Holder for facing and forming O.D. of oil slinger ring on crankshaft.



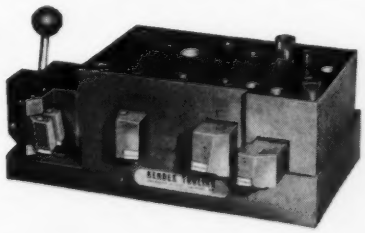
Special Kendex Holder for back facing gear plate of output shaft and planet carrier assembly through hole in gear blank.



Special Hollow Milling Head for finish turning O.D. of bearing diameters, forming radius and chamfering of diesel tractor roller idlers.



Boring Head for rough and finish boring of flywheel housing.



Rear Slide Tool Block for machining (finishing) gear transmission countershaft.

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PRODUCTION LINE-UP FOR '61

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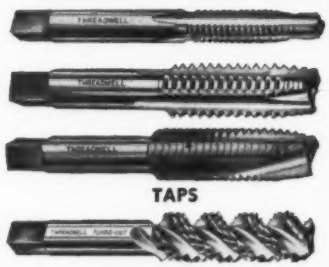
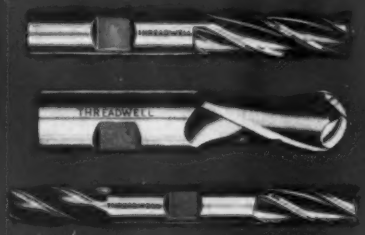


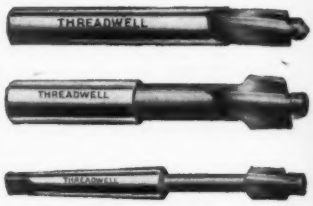
TAPS

TURBO-CUT TAPS

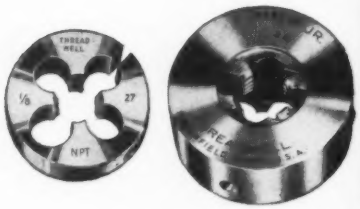


NEW

END MILLS



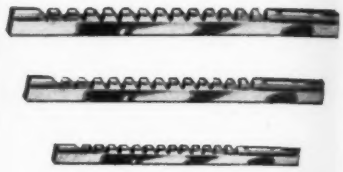
COUNTERBORES



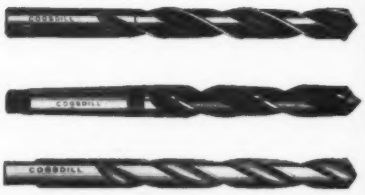
DIES

NEW

MILLING CUTTERS



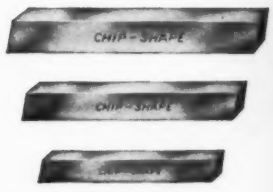
KEYWAY BROACHES



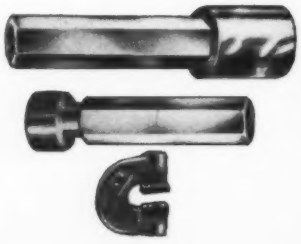
COGSDILL DRILLS

NEW

REAMERS



CHIP-SHAPE TOOL BITS



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14	27	69	86	103	1012	1122	1163	1211	1252	1301	1344	

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C1	C10	C19	C28	C37	C46	C55	P3	P12	P21	P30	P39	P48
C2	C11	C20	C29	C38	C47	C56	P4	P13	P22	P31	P40	P49
C3	C12	C21	C30	C39	C48	C57	P5	P14	P23	P32	P41	P50
C4	C13	C22	C31	C40	C49	D1	P6	P15	P24	P33	P42	P51
C5	C14	C23	C32	C41	C50	D2	P7	P16	P25	P34	P43	P52
C6	C15	C24	C33	C42	C51	D3	P8	P17	P26	P35	P44	P53
C7	C16	C25	C34	C43	C52	D4	P9	P18	P27	P36	P45	
C8	C17	C26	C35	C44	C53	P1	P10	P19	P28	P37	P46	
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C8	C17	C26	C35	C44	C53	P1	P10	P19	P28	P37	P46	
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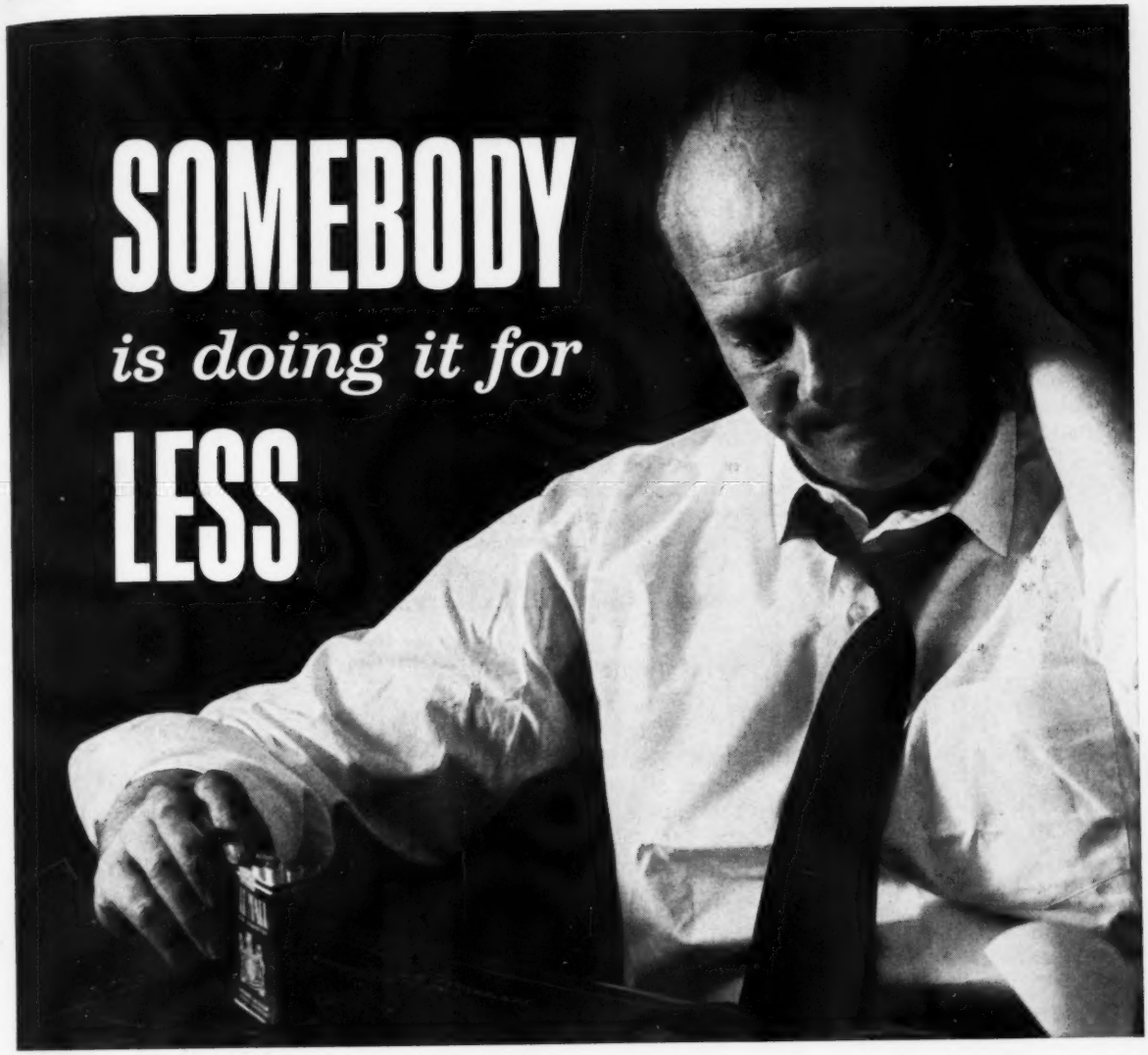

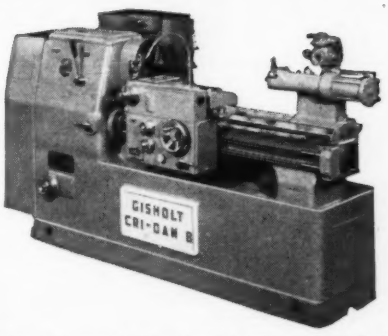

Gisholt CRI-DAN Model B Automatic Threading Lathe—Sets up in 8-15 minutes. Uses inexpensive single-point carbide tools to produce all types of internal and external threads: single- or multiple-start, coarse or fine, left- or right-hand, straight or tapered, standard or special form—in any material, including new high-tensile, hard alloys.

Optional accessories for the CRI-DAN B permit you to combine precision threading with tracing, turning, boring and facing cuts in one fast, automatic cycle. Other models are available. Call your Gisholt Representative or write for Catalog 1215.

While others are saving 30% to 80% with a new but proved threading technique, can you afford to stay with conventional methods?

With a Gisholt CRI-DAN High-Speed Threading Lathe, you can now use inexpensive single-point carbide tools to produce *quality* threads—simple or complex—*automatically*. A large number of progressive manufacturers (perhaps your toughest competitors) have found that the CRI-DAN technique cuts costs throughout the plant—with *direct* savings in initial costs, reduced threading times and tooling requirements—with *indirect* savings in tool inventory, materials-handling, floor space and planning.

Whether you're threading in lots of 6 or 600, the CRI-DAN technique will permit you to do it for less.

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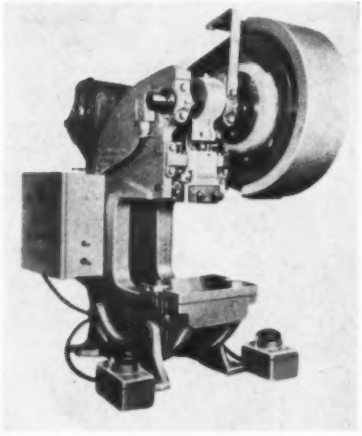
CIRCLE INFORM-A-GRAM KEY NO. 105

Product News

Electro-Magnetic Clutch

A new electro-magnetic clutch, without sliding keys, makes erroneous operation of a press virtually impossible. Mode of operation is dialed, either automatic (continuous run), or any of the single trip positions. Actuation lag is greatly reduced and certain flying-cut-off applications are possible due to instantaneous pick-up.



Multiple press installations can be automated with single program and the clutch is adaptable to all new and existing Benchmaster punch presses. Write Benchmaster Mfg. Co., 1835 Rosecrans Ave., Gardena, Calif., or circle Inform-A-Gram No. P1.

Weigh It on Wheels

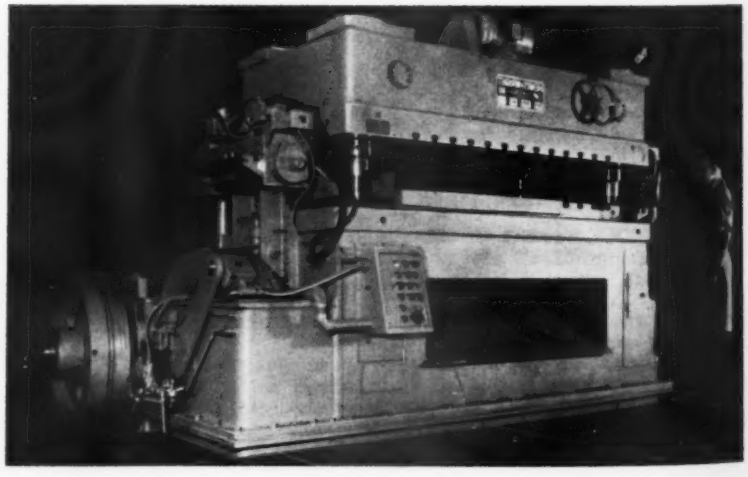
"Hydroscale" should be a boon to materials handling, as it can be installed on any make fork lift truck, new or old. Manufactured by Hydroway Scales, Inc., 31302 Stephenson Hwy., Madison Heights, Mich., the unit lock-clamps into place in minutes and can maintain a plantwide continuous inventory by weight. Parts and material can be weighed for closer production and process control. The mobile platform scale is a hydraulic compression cell type, completely self-contained unit. As a complete weighing system, it has no connection to the hydraulic system of the truck it is attached to. Write the maker, or check Inform-A-Gram No. P4.

Right Angle Drill

The new 61A series, largest in the family of air-powered 90° angle head drills, is available in speeds of 1000, 700, and 500 rpm with either safety lever or thumb flip throttle. Maximum capacity for the largest of the six models in the series is ½″ dia. The portable tools range from 16 to 17⅞″ and weigh from 8¼ to 9 lbs with 2″ high angle head by 1¾″ dia. The tools are made of steel with exception of the handle. Write Buckeye Tools Corp., 5003 Springboro Pike, Dayton 1, Ohio, or circle Inform-A-Gram No. P3.

Double-Crank Dieing Machine

A 250-ton automatic double-crank dieing machine, equipped with progressive dies, embraces many complex stamping and forming operations in one production sequence. The Henry & Wright machine was built by H-P-M Div., Koehring Co., Mount Gilead, Ohio, for a large automotive manufacturing operation. Double-crank arrangement supports the upper cross-head at both ends. The two-point suspension principle results in rigidity and strength against off-center loading flexibility in the ratio of die-bed area to press capacity. Circle No. P2.



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Pin oilers in place on die set.

These simple, inexpensive pin oilers fit over each leader pin and seal in place with a rubber neoprene washer. Each cup is filled with oil so each downward stroke brings bushing in contact with oil and upward stroke distributes oil evenly over leader pins. You'll eliminate bushing wear, leader pin scoring, and maintain die accuracy with these oilers.

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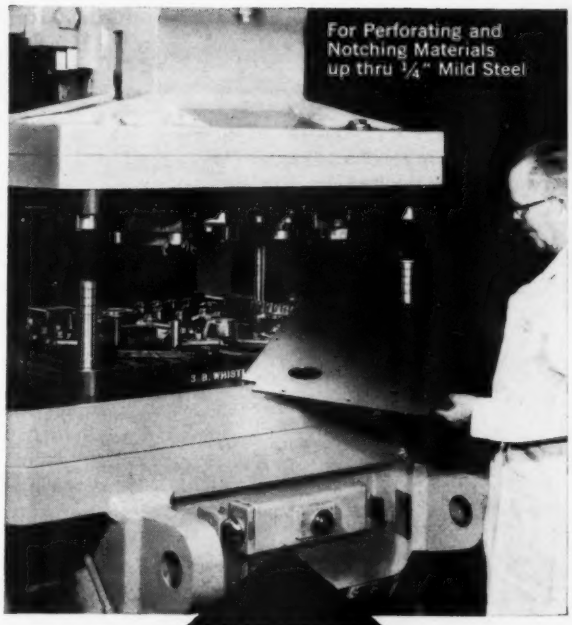

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save thousands $$$ in tooling costs

Interchangeable punch and die parts are readily arranged on Tee-Slot die sets. The same parts can be used again and again in different groupings. You profit in numerous ways:

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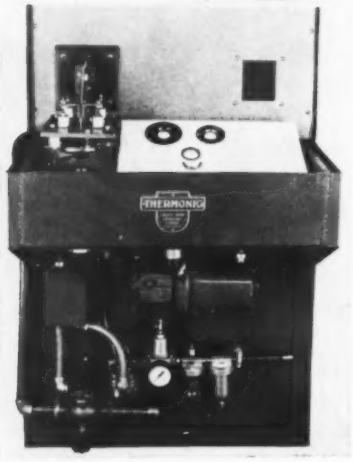
CIRCLE INFORM-A-GRAM KEY NO. 1073

Product News

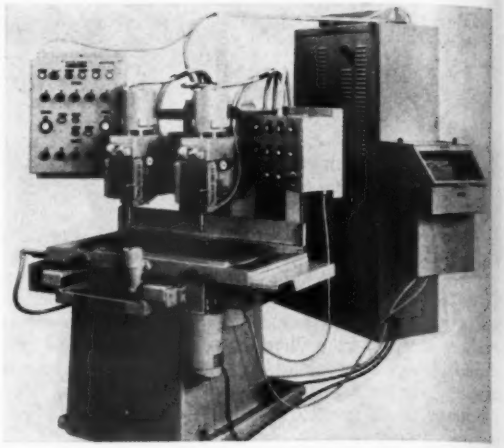
Hardening of Bearing Races

It now takes less than 5 sec to harden bearing races. Uniform hardness is achieved on angular surfaces, despite narrowness of parts. Hardness is restricted to surface penetration of 0.015 to 0.020 depth. Credit for this feat goes to Ther-Monic Model 500 generator,



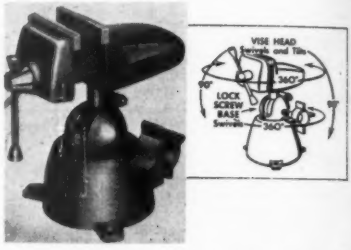
designed and built by Induction Heating Corp., 175 Fifth Ave., N.Y. 10, N.Y. The machine and work coil are so precise that it is possible to heat the working surface to a temperature of more than 1650°F, while the metal only 0.020 away remains cool enough not to harden. More information from the maker, or circle Inform-A-Gram No. P5.

Tape-Controlled Drilling



Precise hole patterns, required in electric printed circuit boards, can be produced with a new tape-controlled drilling machine by Leland - Gifford Co., Worcester, Mass. Modified GE Mark II numerical positioning control with fast tape reader can be programmed either by a Flexowriter or directly from the drilling machine via pattern or sample board. Positioning accuracy is ±0.001", non-accumulative, with repeatability of ±0.0005". Each automatic cycle includes rapid approach and rapid return with 4⅜" spindle traverse and 400 lbs maximum drill thrust pressure. Write the manufacturer, or circle Inform-A-Gram No. P7.

Multi-Position Workholder



A new time-saving work holding device accepts work quickly and allows accurate positioning with machine tools, such as drilling to close tolerances. Named "Pana-Vise," the tool consists of a removable vise head with a ⅝" dia post that fits into the positioning base and is held between two recessed pressure discs. The vise head or fixture can be rotated 360° on any tangent to a half sphere to achieve any compound angle, or tilted a full 180° front and back. Locking mechanisms can be rotated 360° around the base. For more information on this versatile tool, write Colbert Die Cast Co., Inc., South Gate, Calif., or circle Inform-A-Gram No. P8.

Speedy Soft Soldering

A new Therm-Monic machine soft-solders the ends of caps to fuse links at the rate of 3000 fuses/hr. Besides doing the soldering operation, the machine is equipped with a conveyor type work-coil which passes completed parts through a sizing device. This pushes the cap snugly up to the link for 100% contact with the cap and all fuses emerge in uniform length. The unit also checks fuses for continuity before they leave the conveyor, rejecting substandard parts. More on this automation of a once tedious job, from Induction Heating Co., Brooklyn, N.Y., or by checking Inform-A-Gram No. P6.

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heavy duty unit services up to 19 MACHINES

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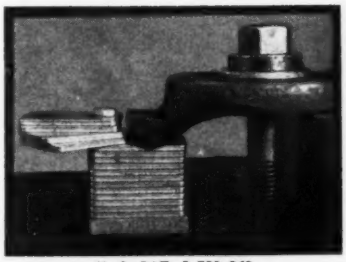
HANDY ADJUSTABLE

RISER BLOCKS



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- Give heights from 3/8" to 2 3/8" in 1/8" increments.
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- Cost only $7.50 per pair; $75.00 per 12 pairs, plus transportation costs. Shipping weight 3 lbs. 10 oz. per pair.

ORDER TODAY. USE THIS COUPON.

HANDY PRODUCTS
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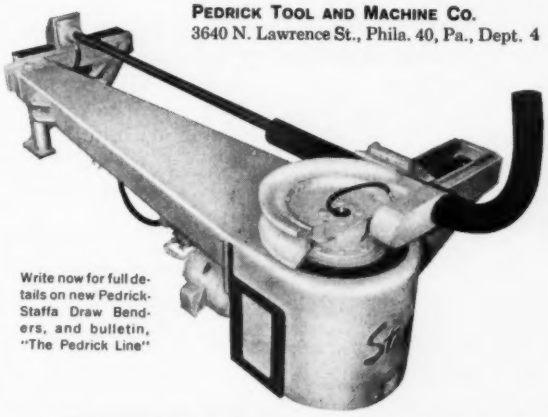
3640 N. Lawrence St., Phila. 40, Pa., Dept. 4



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BEND WITH PEDRICK

CIRCLE INFORM-A-GRAM KEY NO. 1092

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Complete information, sizes and prices on H.S.S. and carbide rotary cutting tools. Available from stock.

Rotary FORD Tools

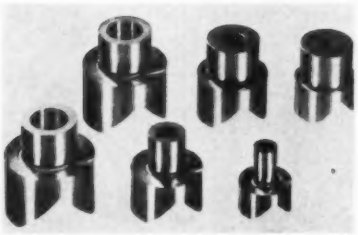
Contact your local distributor or write
M. A. FORD MFG. CO., INC.
Dept. TP-361, 1545 Rockingham Rd.
DAVENPORT, IOWA

CIRCLE INFORM-A-GRAM KEY NO. 1093

Product News

Bushing Liners

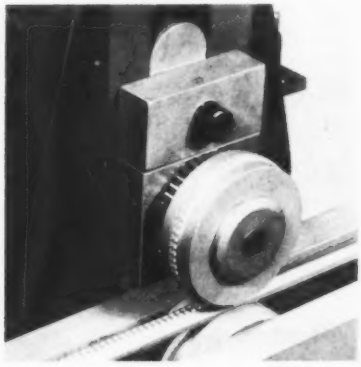
Precision drilling of cylindrical, square and hex stock can now be facilitated with automatic, self centering "V" bushing liners. Developed and marketed by Acme Industrial Co., 200 N. Laflin St., Chicago 7, Ill., the bushing liners for removable bushings groove themselves dead center on stock to be drilled, permitting drilling even near ends of bars. Conveniently packaged, the bushing liners come in 2 sets of 3 bushings, one



set of 3 with ¾" OD and the other set with varying OD's. Both sets accommodate slip bushings with OD's of 3/16, 5/16 and ½" in a range from #80 drill to 11/32" in ASA or Acme standard sizes. Write Acme direct, or circle Inform-A-Gram No. P10.

Marking Fixtures

Continuous marking of symbols or trademarks along the full



length of screw machine bar stock, aluminum extrusions or special machine parts, can be done with new motorized G-R-D fixtures. The marking die rotates at 58 rpm allowing continuous impressions as close as 1/32" or as far apart as 1/16". Basic components of the unit include a 1/3 hp motor (1750 rpm), a single revolution solenoid operated clutch for non-continuous marking operations, a marking roll with chosen symbols or lettering, T-handle for fine marking depth adjustment, and a cradle or mandrel for holding parts designated for marking. The series supplement the group of 20 hand-operated fixtures previously available from M. E. Cunningham Co., 1025 Chateau St., Pittsburgh 33, Pa. Inform-A-Gram No. P11.

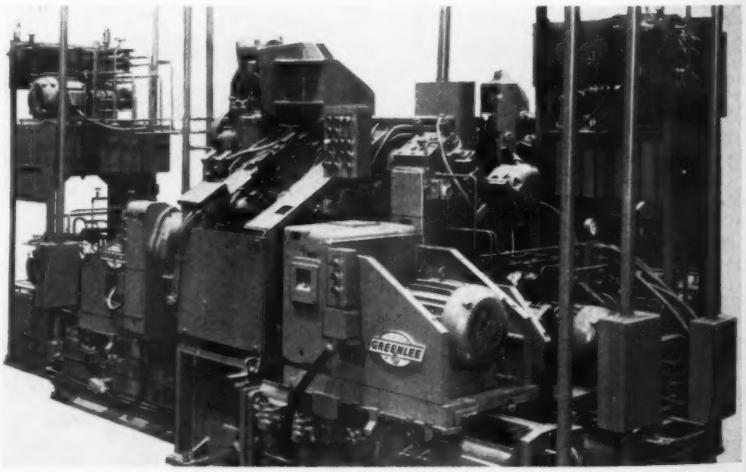
Small System After Cooler

A new aftercooler for compressed air systems has made hot and wet air problems passe. Built for 50 to 120 cu ft/min of free air, the Murphy A4VC after cooler boasts a cooling chamber of only 4½" dia. Cooler lengths vary from 40¾ to 95¼" over-all. A noncorrosive copper coil attaches to the flanged

head with flared connections. The entire coil length is spaced with baffle plates serving as air flow directors. Gravity releases separated moisture to the Murphy ball float trap. Jas. A. Murphy & Co., Inc., 1421 High Street, Hamilton, Ohio, guarantees cooling to within 85% of the cooling water temperature. Inform-A-Gram No. P12.

Automatic Indexing Machine

A new 4-way, 4-station horizontal automatic indexing machine was recently delivered by Greenlee Brothers Co., Rockford, Ill. The machine is credited with production of 660 cast iron cylinders per hour at 80% efficiency. Four pieces are power clamped in station 1 and move through the 4 stations in 17.4 sec. The machine has two hydraulic centers. More information available from the manufacturer, or circle Inform-A-Gram No. P9.



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DRILLS 5/16" IN STEEL!

PRECISE AUTODRILL

It takes little space (just 2" wide, 12" long, 7" high) — mounts in any vertical or horizontal position on 2-inch centers — has 5/16" drilling capacity in steel! Precise Autodrill is a fully automatic drill unit with depth accuracy to .001". It's electrically operated, has air controlled advance and retract with continuously variable hydraulic infeed. Maximum stroke is 1½". Spindle speeds range up to 6000 rpm. Compact, modular design permits single or multiple setups — an electric and pneumatic interlock is provided for automated setups. Two compact tapping heads are available — handle up to #10, and 5/16" taps.

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Quality and Precision Since 1882

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3741 Blue River Road, Racine, Wisconsin, U.S.A.
Branch Plant: Precise, G. m. b. H., Duesseldorf, Germany

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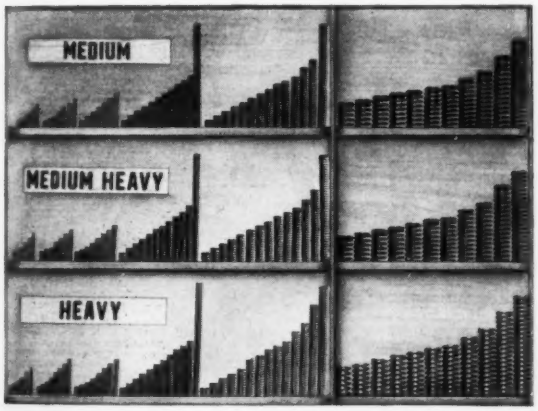

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Fine quality die springs carried in stock —wide selection of hole and rod sizes, lengths and deflections. Three pressure ranges — medium, medium-heavy, heavy. Long life reduces down-time.

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6001

Raymond Manufacturing Division
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Corry, Pennsylvania

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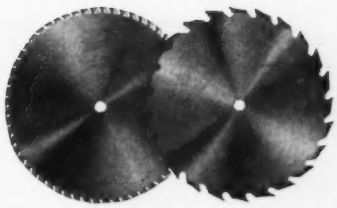

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MEYCO MAINLINE: An extra quality, low cost, standard line of saws, 6" to 16" diameters, with the famous UNI-CHIP grind (alternating double bevel and raker teeth) at low, low prices. **In stock: immediate delivery.**

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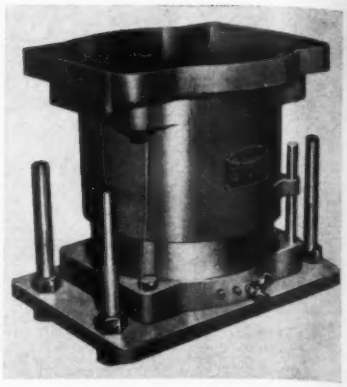
GRAPHIC SYSTEMS
YANCEYVILLE, NORTH CAROLINA
CIRCLE INFORM-A-GRAM KEY NO. 1121

Product News

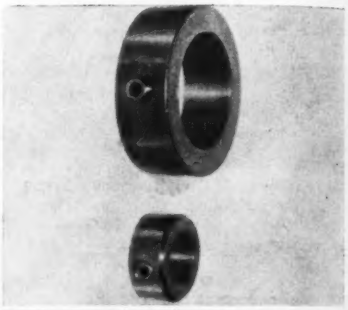
Pneumatic Die Cushion

A new all-steel telescopic full universal pneumatic die cushion for all power presses has been constructed by Dayton Rogers Mfg. Co., Minneapolis 7, Minn. The die cushion will give ring holding pressure on practically any power press without a press bed pit. A custom made ground pin pressure pad fits the entire press bed opening, providing minimum height for bolster plate mounting or press bed mounting. Complete with a combination pressure gage and regulator valve and all necessary fittings, the ready-to-install die cushion is engineered to any press requirements. Write the manufacturer, or mark No. P14.



Design Set Screw

New shaft collars to fit all shafts from ¼ to 3" OD in 1/16" graduations are now equipped with a special socket set screw. The latter is said to give greater holding power than cut or knurled point types. Detailed specifications on these black penetrate finish steel shaft collars, from Jergens Tool Specialty Co., 712 E. 163 St., Cleveland 10, Ohio. Circle P13.



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Severance TOOL INDUSTRIES INC.
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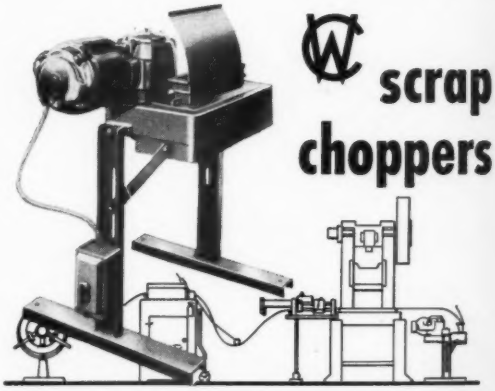


W scrap choppers

FOR FAST, LOW COST SCRAP HANDLING

Cooper Weymouth scrap choppers take skeleton strip as it comes from the press and chop it quickly and efficiently into a size that is easily handled and stored for collection. Save time, trouble and space in busy press rooms. Self contained units are fully portable, heads tilt to any desired feed angle. Available in three sizes to handle stock .156 x 5" or .093 x 12". Only one moving part; jam proof orbital cutting action.

Inquire about Cooper Weymouth stock reels, part and stock straighteners, mechanical and air operated slide feeds.

COOPER WEYMOUTH, INC.
603 Honeyspot Road, Stratford, Conn.

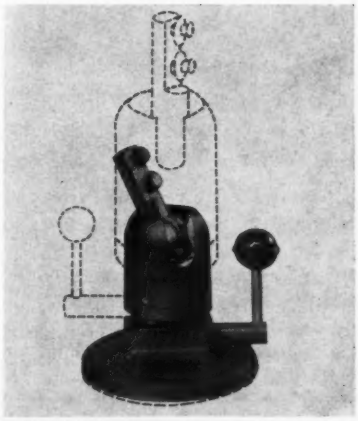
CIRCLE INFORM-A-GRAM KEY NO. 1123

Product News

Brush-In-Can Layout Fluid

Layout fluid for general shop and layout use is now available in practical 1 pt and 1 qt cans with large brush-in-cap. The new formula fluid gives a much darker (die blue) background against the scribed lines of layouts. According to Dayton Rogers Mfg. Co., Minneapolis 7, Minn., the fluid dries instantly with a simple brushing or wiping of the surface. Inform-A-Gram No. P15.

Easier Bench Operations



"Low Boy" is the new companion of the standard PowRarm by Wilton Tool Mfg. Co., Inc., 9525 Irving Park Rd., Schiller Park, Ill. Designed to make low bench operations easier, the 3" shorter unit holds a workload of 50 lbs, operating on the principle of locating work closer to the bench surface. Base dimension, size of swivel ball, and mounting dimension all remain the same as the other unit. The manufacturer will furnish additional data on Model 311 "Low Boy." Inform-A-Gram No. P16.

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- Provide Greater Precision
- Available for ½" to 6½" Shafts
- Will stand greater sidewall pressures

Get time, tool, and money-saving advantages by replacing solid bushings with Jergens adjustable roller bearing units. Available for ½" to 6" shafts or with straight roller bearings where space is a factor in ½" to 2" shaft sizes. Write today for complete information and authentic case histories.

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Dept. TP-3 • 11106 Avon Ave. • Cleveland 5, Ohio

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ADJUSTABLE
DRILLING
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Drills, taps metal, wood, plastics. 2-minute setup on most drill presses; quick, accurate adjustment. Variety of models, 1/2" to 12-5/" centers. . The drill spindles are held rigidly in position when two nuts are tightened. Sturdily constructed. Suitable for adaptation to large or small drill presses. Models A and B made with sleeve. Models C and D with over-arm adaptation, equipped with guide pins, springs and brackets, mounted to a cast-iron base with surfaces ground for use of drill fixtures. All models can be used for drill or tapping on tapping machine or drill press with reversible spindle. Also used with standard tapping heads. Multiple heads with fixed center distances are designed and built to meet your requirements. Available with GM Sleeves, Morse taper or drill chucks. Write for full information.

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A matched set of transfer punches for toolmakers, machinists and tool cribs.

Used for transferring location of threaded, drilled and reamed holes, slugs, blanks, etc.

Precision made of finest tool steel carefully heat treated and tempered for long life. .0025 undersize to facilitate use—black oxide finish.

Set No. 3-17: 28 punches with indexed stand — sizes 3/32" to ½" by 1/64" plus handy 17/32" size—length 4⅞". PRICE only $19.40

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R. L. SPELLMAN CO. • Urbana, Ohio

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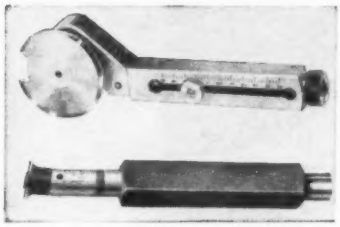
CUTS THREADS 40% FASTER!

Graduated scale for angular setting



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Cut costs sharply with MP tools for internal or external use. Thread is engaged depthwise by circular cutting disc (hign speed or carbide) which has negative profile and adjustable angle. Machines both thread flanks simultaneously. Shavings released separately, can't disturb thread formation. MP pays for itself in savings. Swiss made with Swiss precision. Stock carried in U.S.

ACME TOOL CORP.

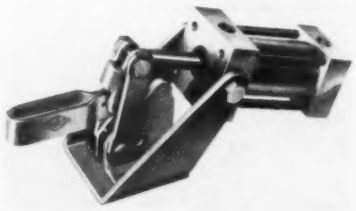
P. O. Box 1165 Coral Gables 34, Fla.

CIRCLE INFORM-A-GRAM KEY NO. 1141

Product News

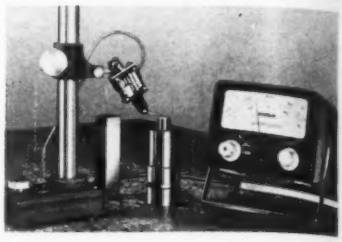
Toggle Clamps

A new series of air- or hydraulic-operated toggle clamps has been introduced by Detroit Stamping Co., 330 Midland Ave., Detroit 3, Mich. The clamps feature over-center toggle locks that eliminate bounce or recoil, and can be used individually, in series, sequentially



or simultaneously. They're work-rated with holding pressure to 450 psi at 80 psi line pressure. The series consists of three models, each weighing 1 lb 10 oz and providing clamping pressures to 350 lbs. Inform-A-Gram No. P17, or write the manufacturer.

Electronic Gaging Unit

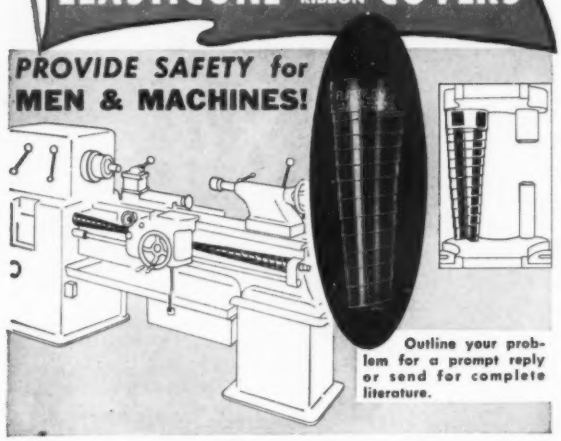


Electro-Probe is a new compact electronic gaging unit with a versatile gage head and lightweight, battery-operated, all-transistor amplifier meter. There is no need for warmup time, as transistors and battery power spring into instant action. All components, including gage head, battery, and accessories, are contained within the housing of the amplifier, which is also the carrying case of the gage. Carrying handles serve as adjustable legs, allowing setup at any angle for easy viewing. According to Federal Products Corp., 1144 Eddy St., Providence, R.I., any two of six different gaging ranges from 0.0002 to 0.010" can be combined with magnifications up to 11,000X. No. P18.

OUT GO SHUTDOWNS . . . INJURIES . . . REPAIRS

ELASTICONE® STEEL RIBBON **COVERS**

PROVIDE SAFETY for MEN & MACHINES!



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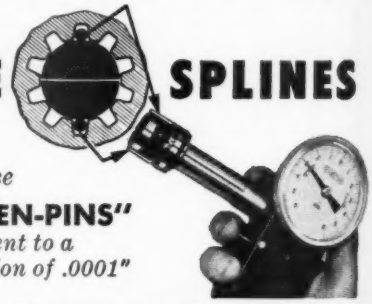

with precise

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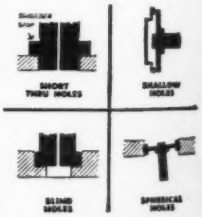
measurement to a fraction of .0001"

COMTORPLUG with interchangeable expanding plugs to gage simple or special holes from ⅛" to 10" dia.

Insert into your spline or internal gear the unique expansion plug equipped with gaging wires . . . let it expand to firm contact . . . and you see the exact between-pins size shown in large graduations easily readable to a fractional tenth. For simple as well as special holes, Comtorplug's "automatic-accuracy" gaging has won a place in the production control set-ups of hundreds of fast-moving programs. *See why —request 8-page illustrated bulletin.*



COMTOR CO.

82 Farwell Street, Waltham 54, Massachusetts

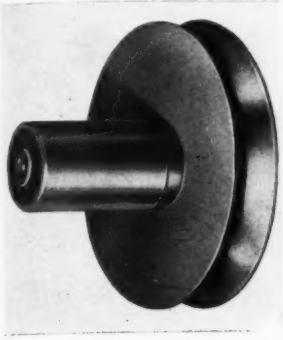
REQUEST BULLETIN 50

CIRCLE INFORM-A-GRAM KEY NO. 1143

Product News

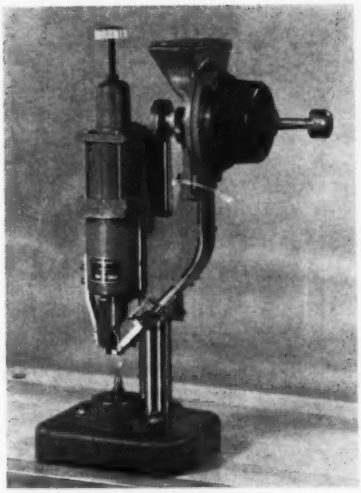
Variable Speed Pulleys

Latest from Lovejoy Flexible Coupling Co., 4979 W. Lake St., Chicago, is a line of pulleys with instant variable ratios up to 3 to 1. Rated at 20 to 25 hp at 1750 rpm and 10 to 15 hp at 1150 rpm,



the pulleys have curved faces to maintain full belt contact at all speeds and pitch diameters. To give trouble-free service and quiet operation, pulleys are dynamically balanced. Positive lubrication is assured through alemite fittings. Inform-A-Gram No. P19.

Tubular Riveter



An all electric bench type, hopper-fed riveter for feeding and setting tubular rivets and other small fasteners up to ⅛" dia is introduced by Black & Webster, Inc., 570 Pleasant St., Watertown, Mass. Model SMR Electrorivet is lauded for speed, safety, compactness and mobility. Write the manufacturer, or check Inform-A-Gram No. P20.

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- HAND KNOBS
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- HANDLES
- BALL HANDLES
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- SPECIALTIES

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by ANTONI NIEDZWIEDZKI
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NEW!

1961 CATALOG-PRICE LIST

Catalog No. 6, illustrating standard fixture clamps, jig and fixture details, from the industry's best known and largest manufacturer.

Complete and generous stocks of standard items are available from the Morton factory and strategically located warehouses, and distributors.

Call your local distributor, or write to the factory today, for your copy of this informative catalog.

MORTON MACHINE WORKS • Division Brubaker Tool Corp.
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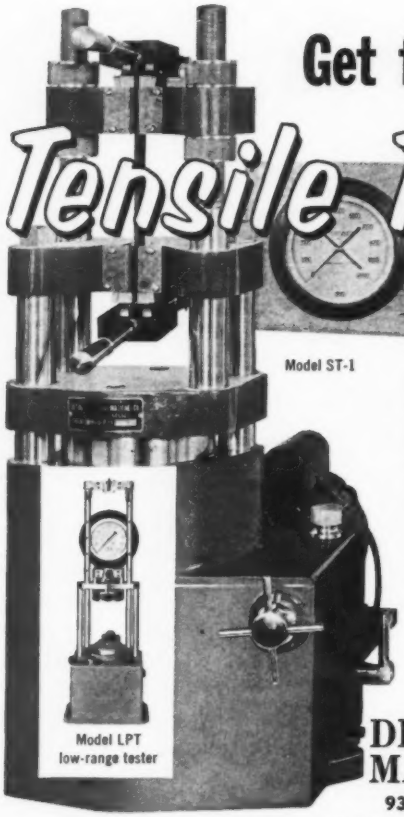
CIRCLE INFORM-A-GRAM KEY NO. 1152

Get fast, accurate

Tensile Testing

hydraulically



Hydraulically powered Detroit tensile testers put you in command of every phase of the test. Self-acting, open-sided specimen grips permit easy specimen insertion. Constantly controlled hydraulic rams apply up to 40,000 pounds, smoothly and quickly. Special load gauges, grips, or other modifications gladly supplied.

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DETROIT TESTING MACHINE COMPANY

9386 Grinnell Avenue, Detroit 13, Mich.

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S&E

SOLID CARBIDE GAGES

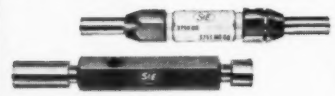
✓dependable accuracy to start with...

✓repetitive accuracy to work with...

S&E solid carbide gages will remain true to size longer—up to 50 times longer than steel gages. You'll **know** you are **correct to size** and continue to be . . . long after you have saved the cost, over and over again, of an S&E gage.

S&E gagemakers work with the finest gagemaking equipment and materials, under controlled atmospheric conditions — producing the optimum in gage accuracy and economy. Place an order now—you'll be glad you did.

Cylindrical Plug Gages
tri-lock—taper lock—progressive—reversible



Ring Gages

Master Setting Discs

S&E "Thrifty" Gage

tolerance classes: xx-x-y-z
special tolerances available

Complete catalog of S&E tools available on request.

S&E MACHINE PRODUCTS INC.

Bridgeport, Michigan

Offices in all principal cities.

CIRCLE INFORM-A-GRAM KEY NO. 1162

Product News

Hydraulic Relief Valves

Pilot-operated relief valves for machinery hydraulic systems have been developed by Parker-Hannifin Corp., 17325 Euclid Ave., Cleveland 12, Ohio. The valves are a companion line to the machinery

hydraulic check valves. The new line-mounted valves are for 3000 psi hydraulic systems, while gasket-mounted units are rated at 5000 psi. Both series are of 20 to 50 gpm capacities. Subplates are offered for gasket-mounted types. For installing fittings, the valves can be held with standard wrenches or in a vise. Valves are mountable in any position. Write the maker, or circle Inform-A-Gram No. P21.

LIFTING DEVICES

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FAST • SAFE • BETTER Material Handling of

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400 MODELS

H. L. BUSHMAN CO.

100-A W. Central Ave.
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MAGNETIC BASE INDICATOR HOLDER

Model 2008—Price $6.95

¼" dia. non-magnetic stainless steel rod complete with 5/16" and ⅜" O.D. bushings. Fine precision adjustment identical to surface gage. Hardened ball socket setting permits universal positioning.
Powerful 50-lb. pull magnetic base insures firm grip on any ferrous surfaces curved or flat.

Write for Catalogue #958

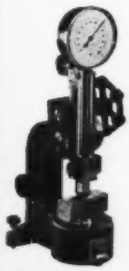
CULLEN MANUFACTURING CO., INC.
1603 Washington Ave., Racine, Wisc.

CIRCLE INFORM-A-GRAM KEY NO. 1164

Convertible Band Saw

The new Wells Model 300 metal cutting band saw is ideal for cutting angles, slots, notches and bevels. This dual-purpose machine can be used as a horizontal cut-off unit or an upright band saw. Maximum horizontal cutting capacity is 3½ x 6″ for rectangular shapes, 3½″ dia for rounds (3″ pipe.) A 115 V ¼-hp motor offers selective blade speeds of 54, 100, and 190 fpm. Unattended operation is possible due to gravity feed and an

automatic shut-off switch. Overload protection is provided. To convert into vertical saw, the head is swung into a vertical position. The frame unit features 4 x 6″ integral work table. Over-all height is 34½″ horizontal and 51″ vertical. Throat height is 7″ and depth 6″. Write Wells Mfg. Corp., 1940 Cedar St., Three Rivers, Mich., or circle P22.



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has been done with the SCLEROSCOPE
Since 1907
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THE SHORE INSTRUMENT & MFG. CO., Inc.
90-35 Van Wyck Expressway
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CIRCLE INFORM-A-GRAM KEY NO. 1171

KELLER Die Filers
Deluxe $159.00

3 MODELS
ECONOMY—4 Way tilting table, with motor, $119.00
STANDARD—Has file roller support, with motor, $139.00
DELUXE—Has reciprocating vertical slide, with motor, $159.00

Sales Service Mfg. Co.
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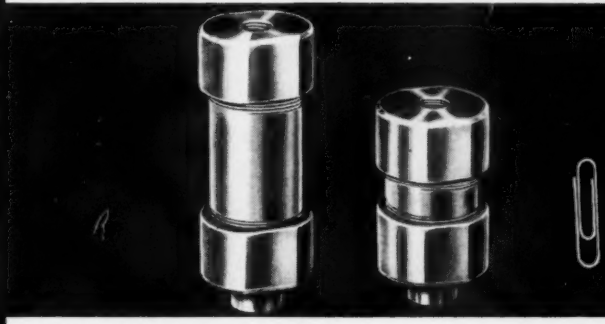
St. Paul 14C, Minnesota

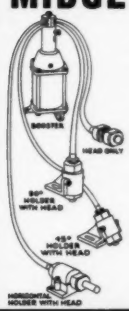
Ask your Industrial Distributor or write TODAY for BULLETIN 660

CIRCLE INFORM-A-GRAM KEY NO. 1172

BIG GRIP FOR TIGHT PLACES!



with Wilton's NEW
MIDGET air-hydraulic PowRlock!



Holding problem in a machine operation where clearances are critical? The new Midget PowRlock is your answer. Although the Midget is smaller than a pack of cigarettes, it develops holding forces up to 1900 pounds! Securely holds and positions regular or irregular pieces. Four 1″ or eight ½″ stroke heads may be operated from a single booster.

WILTON TP-31

WILTON TOOL MFG. CO. INC. / SCHILLER PARK, ILL.

Attach this ad to your letterhead and mail for free literature!

CIRCLE INFORM-A-GRAM KEY NO. 1173

HARDEN TOOLS — DIES WEARING PARTS WITH HARD-N-TUFF

EASILY Heat—plunge into HARD-N-TUFF—reheat and quench—and, you've put a file hard surface on any metal tool, die or part—a surface that cannot crack, scuff or spall off.

QUICKLY In five minutes or less, you've extended the wearing life of the piece at least 3 times—possibly as much as 40 times.

at LOW COST Apply HARD-N-TUFF only to critical wearing areas—not entire pieces. Make tools, dies, parts of inexpensive mild steel; treat with HARD-N-TUFF for wear equivalent to tool steel.

With fast-acting, non-toxic HARD-N-TUFF, you can harden right in your own shop. Your available heating equipment will do—even a welding torch for small items. Use HARD-N-TUFF to get longer wear from:

ORDER DIRECT or THROUGH YOUR DISTRIBUTOR
1 lb. CAN - $8.95 • 3 lb. CAN - $26.00
"IT'S THE SURFACE HARDNESS THAT COUNTS"

HARD-N-TUFF CORPORATION
Box 275a, Huntington, New York

CIRCLE INFORM-A-GRAM KEY NO. 1174

Pick the one that's right for your job!

It pays to specify

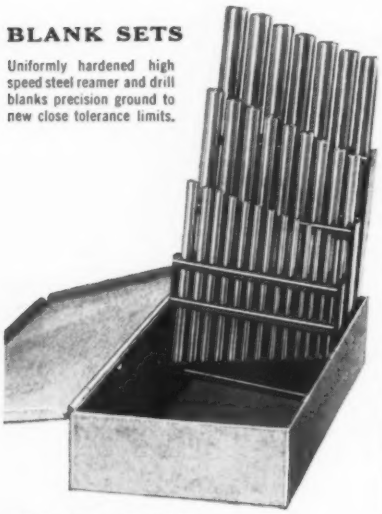
ACE

DRILLS
REAMERS
BLANKS

Carbide Tipped and Solid Carbide
Premium Quality High Speed Steel

BLANK SETS

Uniformly hardened high speed steel reamer and drill blanks precision ground to new close tolerance limits.



DRILL SETS

Standard stock sets include Fractional, Wire and Letter size drills, packaged in convenient folding index cases.

Call your local distributor today—or write Ace direct for latest catalog and price information.

ACE DRILL
Adrian, Michigan

ORIGINATORS OF "GROUND-FROM-THE-SOLID" DRILLS

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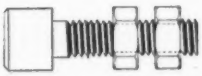
REST BUTTONS OF MANY TYPES
To Save Time and Labor



ADJUSTABLE WITH JAM NUTS

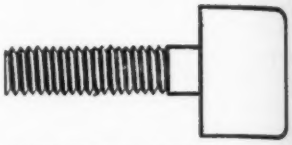
Has many tooling applications. Also used as jig feet, adjustable jacks and machine stops. Each has two hexagon jam nuts. Cyanide hardened. Black penetrate finish. Four sizes.

QUARTER-TURN SCREWS

Used extensively on jig and fixture work. Black penetrate finish. Soft. Seven Sizes.

OTHER TYPES

Include Press-Fit in 3 sizes. Circular Jig Feet and Jig Rest Pads also available.



HEX-HEAD SCREW

The latest thing in jig feet. Easy to install. Body length held. Black penetrate finish.

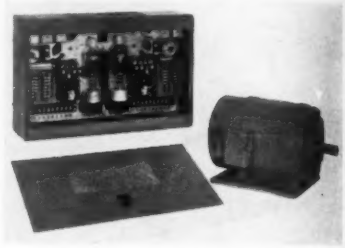
Send today for Reid's big free 88 page catalog, listing 2,000 items needed in tool rooms.

REID TOOL SUPPLY CO.
MUSKEGON HEIGHTS, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1182

Product News

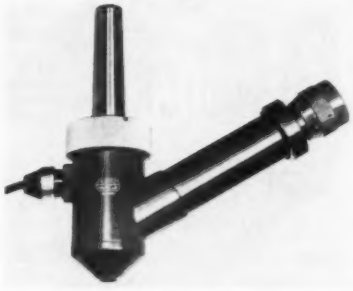
Adjustable Speed Drives



Two new sizes of electronic adjustable speed drives have been added by Cleveland Machine Controls, Inc., 1155 Brookpark Rd., Cleveland 9, Ohio. Size 3 is rated at 3-hp maximum and size 4 at 7½-hp, with speed ranges attainable to 100:1. By controlling the thyratron tubes with a magnetic amplifier, the drives will hold within 2 or 3% of set speed under widely varying loads with one or two-tenths of a percent of drift. All size drives include reversing and dynamic breaking. Specifications direct from the manufacturer, or through Inform-A-Gram No. P23.

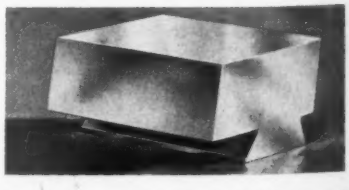
Jig Borer Microscope

The new Leitz borer microscope with built-in light is a completely self-contained unit. A beam splitter directs light through the objective, providing vertical surface illumination. An adjustable eyepiece with a hairline cross and a series of concentric circles, can be used for setting to reference points or for checking center distances between holes. Different shanks, taper or straight, are interchangeable and adjustable for truing. Write Opto-Metric Tools, Inc., New York 13, N.Y., or Inform-A-Gram No. P24.



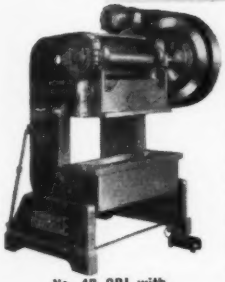
Dovetail Blanks

All sizes of dovetail tools and a choice of either soft blanks, hardened and ground blanks as well as a choice of M-2 high speed steel or T-5 super high speed steel are now available from The Somma Tool Co., 109 Scott Road, Waterbury, Conn. The line of more than 40 items in blanks also allows for T-15 Vasco Supreme high speed steel. Write the makers, or mark Inform-A-Gram No. P25.



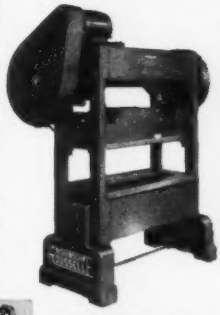
High-Output with ROUSSELLE

DOUBLE-CRANK PRESSES



No. 48 OBI with "Econo-Air" clutch.

SPEED UP PRODUCTION with these versatile 40-ton presses. Large bed and ram areas make them ideally suited to handle wide rolls or sheets . . . do multiple punching, steel-rule die work and other high output operations. For rapid, shockless starting and stopping, presses can be equipped with electrically controlled "Econo-Air" friction clutch . . . Ask for new catalog.



Choice of over 30 models and types in 5 to 60-ton sizes

STRAIGHT SIDE—Die space up to 24 in.; bed space up to 6 ft. between uprights.

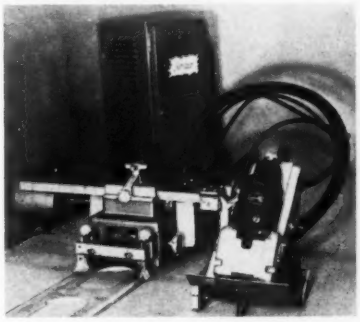
SERVICE MACHINE COMPANY
Mfrs. of Rousselle Presses
2310 WEST 78TH STREET • CHICAGO 20, ILLINOIS

Rousselle Presses are sold exclusively through Leading Machinery Dealers.

CIRCLE INFORM-A-GRAM KEY NO. 1191

Product News

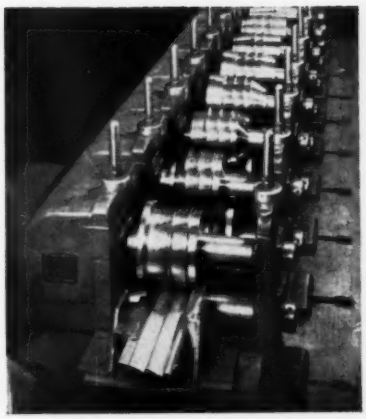
Automatic Torch



Model Q-5 heavy duty torch was designed to automatically groove seams and prepare the edges of heavy plate for welding. Fast travel speed and low heat input keep plate distortion to a minimum. The unit consists of a tractor-driven automatic head with all position adjustment of electrode angle and variable electrode feed. Also included is an Arcair contactor with remote control switch. The manufacturer Arcair Co., Lancaster, Ohio will supply additional data, or circle Inform-A-Gram No. P26.

Arbor Piercing Units

New piercing units by Vogel Tool & Die Corp., 1825 N. 32nd Ave., Stone Park, Ill., can pierce a ¾" dia hole in 11 gage steel, or a 1" dia hole in 14 gage steel, and can perforate tubing up to 1⅝" OD. For use with Vogel compact air press, the units perforate tubing, pipe, moulding, flat stock, angle iron, channel, etc. Components needed are one arbor holding block, one arbor with perforating die bushing for each diameter (arbors, bushings and perforator are interchangeable for various diameters,) one tube rest to fit OD of tube. Also needed are one ⅜" and/or ½" punch adapters plus the perforating punch for desired size. Additional data furnished by manufacturer, or circle Inform-A-Gram No. P27.



Yoder Roll-Forming Equipment mass-produces shapes accurately, economically

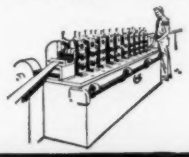
Yoder Roll-Forming Equipment, even with part-time operation, can effect significant savings in many metal working applications and industries. Shapes, simple or complex, can be quickly and economically produced the Yoder way from a wide variety of flat-rolled coated or uncoated stock . . . in thickness up to ¾ inch . . . in speeds up to 50,000 feet per day.

Yoder engineers flexibility and precision into metal forming operations. For example: many basic shape modifications, such as coiling, welding, notching, ring-forming, perforating, and cutting to length can be simultaneously accomplished with little or no additional labor cost.

Yoder also makes a complete line of Rotary Slitters and Pipe and Tube Mills. Profit from Yoder's years of engineering and service experience, contact your local Yoder representative or send for the Yoder Roll-Forming Manual.

This fully-illustrated 88-page book clearly discusses every important aspect of Yoder Roll-Forming Equipment and methods . . . it's yours for the asking!

THE YODER COMPANY
5501 Walworth Avenue • Cleveland 1, Ohio



ENGINEERING YODER MANUFACTURING
COLD ROLL FORMING MACHINES

CIRCLE INFORM-A-GRAM KEY NO. 1192

The most VERSATILE... timesaving press in your shop

Dake Elec-Draulic Presses reduce production time in straightening pinion gears and broaching internal gear teeth for heavy-duty transmissions at the Fuller Manufacturing Company, Kalamazoo, Michigan. Dake Elec-Draulic Presses are used exclusively for the straightening operation because of their infinite control and greater straightening accuracy which reduce over-all straightening time.

For every type of press application, Dake Elec-Draulic Presses provide the same dependable time-saving operation. Their extreme versatility makes them ideally suited for every type of straightening, forming, bending, broaching, cold riveting, and press fit assembly. Standard models are available from 25 tons to 150 tons.

Send for copy of Catalog No. 350A.

DAKE PRESSES

DAKE CORPORATION

634 Robbins Road, Grand Haven, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 1201

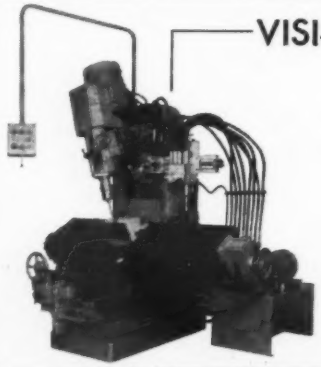
VISI-TROL

BED TYPE

SWIVEL MILL

WITH

SELF CONTAINED HEAD



HEAD AND TABLE TILT 45° EACH SIDE FROM CENTER

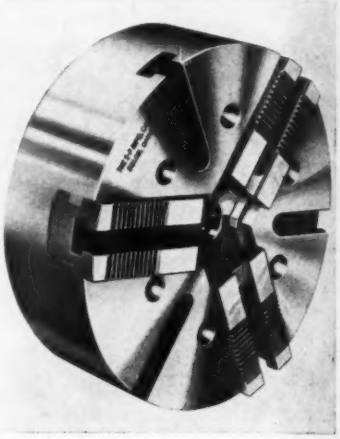
VISI-TROL ENGINEERING CO.
12720 BURT RD. DETROIT 23, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1202

Product News

Self-Centering Power Chuck

A new power chuck is available either as a one-piece steel casting or as a special aluminum alloy forging. It is ground to mirror finish and balanced for high speed production. The 18" chuck has great gripping power for machining with heavier, cost-cutting feeds at high spindle speeds. The



self-centering chuck is also available with a draw tube extension to provide clearance for tools such as boring bars and reamers. An alloy steel bushing is ground in place to keep out dust, and may be used as a pilot for a boring bar and to help prevent bellmouthing. Complete engineering information from S-P Mfg. Corp., 30201 Aurora Rd., Cleveland 39, Ohio, or circle Inform-A-Gram No. P28.

ACME TAPS From Stock!

HIGH PRODUCTION TYPE

with Exclusive

"Lead Screw Pilot"

Improve Acme Tapping with Single Pass Acme Taps. Eliminate Shaved Threads, Improve Finish, Reduce Machining Time.

H&R

The Threading Specialists

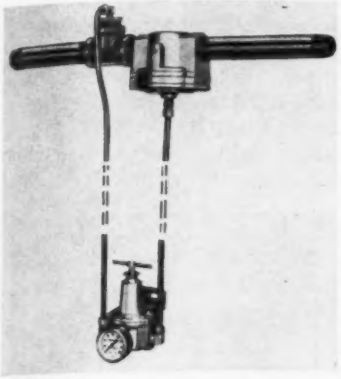
5850 Marshall St., Oakland 8, California

OUR 23RD YEAR

CIRCLE INFORM-A-GRAM KEY NO. 1203

Product News

Pilot-Controlled Regulator



A column of controlled-pressure air replaces the adjusting screw and control spring used in standard regulators. The air column applies constant force on the diaphragm. A "pilot" regulator operates at practically "no-flow," and assures prompt response, with a high air flow rate and accurate pressure control. Hannifin Co., 501 S. Wolf Rd., Des Plaines, Ill., suggests the following uses for the regulators: as a combination regulator and shut-off valve, as pressure control for ganged or multiple air tools, as a pressure stabilizer in downstream sensing systems, and to provide two or more different pressures to a single tool or cylinder. For other uses and further information write the maker, or circle Inform-A-Gram No. P29.

MANY ADVANTAGES:
Very strong • Lightweight (just 13 lbs.) • Low frame, 2" • Wide jaw opening, for heavy or light work • All surfaces hardened and ground at right angles and parallel.

WRITE:
TOOLROOM EQUIPMENT DIVISION
THE PRODUCTO MACHINE COMPANY
945 Housatonic Ave., Bridgeport, Conn.

CIRCLE INFORM-A-GRAM KEY NO. 1211

DEKA·DRILL

MADE IN U.S.A.

...the machine that pays its own way!

DEKA·DRILL is the new 14 spindle machine that drills, taps, dwells and performs deep hole operations while paying its own keep! Here's how: Deka-Drill is economically priced at a figure that any shop can afford . . . production-wise it saves time and money piece by piece over old fashioned operations and permits smaller profitable runs . . . the result is fast amortization while Deka-Drill continues to pile up new earnings!

Deka-Drill is a hydraulically powered, automatic cycle machine with a full 13½" x 18½" working surface, precision made universal joints and ram type slide construction of table and knee! Put Deka-Drill to work for you . . . it's the machine that does so much for so little!

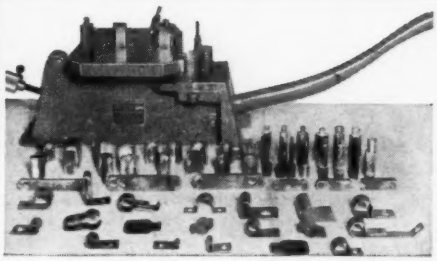
$3975.00

Basic machine with motor and controls, F.O.B. factory.

DEKA DRILL

WANT PROOF POSITIVE OF HOW DEKA·DRILL CAN PAY ITSELF OFF FOR YOUR COMPANY?
Send us your drilling problems for a free time study or clip this ad and mail to us attached to your letterhead for literature. Either way, you'll discover how Deka-Drill can save time and money for you!

PRECISION TOOL AND MANUFACTURING CO. of ILLINOIS
TP-31, 1305 S. Laramie Avenue, Cicero 50, Illinois
CIRCLE INFORM-A-GRAM KEY NO. 1212



WRITE FOR DESCRIPTIVE CIRCULAR

Multiform

BENDER-CUTTER

CUTS, BENDS, PUNCHES

Available in hand, air or hydraulic models. The MULTIFORM is shipped complete with full assortment of dies and mandrels to form and cut round or flat stock up to ⅛" x 1½" as illustrated. Punching dies available. Other models up to ½" x 8" hydraulic operated. Ideal for steel rule die forming.

ALSO AIR OPERATED MODELS

J. A. RICHARDS COMPANY KALAMAZOO, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 1213

NEW

V

BUSHING LINERS*

from ACME INDUSTRIAL

To self center cylindrical, square or hex stock for drilling

V for victory over a previously ticklish drilling job . . . new hardened ground Acme Industrial V bushing liners clamp over cylindrical (round bars, tubing, etc.), square or hex stocks . . . instantly, automatically locate dead center. Layout, jig boring eliminated . . . just center punch, drill and ream hole! Acting as a liner for removable bushings, Acme's "V" assures precision centered drilling always.

Available in 2 sets of 3 V bushing liners to accommodate slip bushings with O.D.'s of 3/16", 5/16" and 1/2" in a range from No. 80 drill to 11/32" in A.S.A. or Acme standard sizes. Acme V bushing liners . . . a must for every tool box.

* patent applied for

ACME INDUSTRIAL COMPANY
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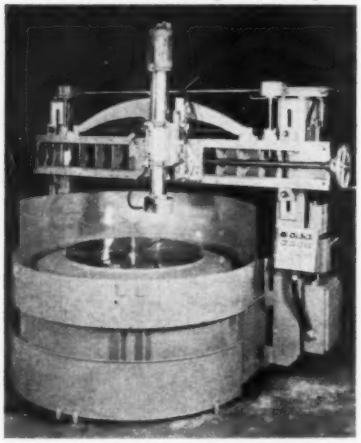
CIRCLE INFORM-A-GRAM KEY NO. 1221

Product News

New Die Grinding Concept



A special grinder designed to work OD's, ID's and surfaces of large die rings has been developed by International Tool Co., Dayton, Ohio. The unit is designed to handle hardened ground rings varying from 40 to 80" dia. It is capable of automatic reciprocating feed in vertical direction and on angles. Write the manufacturer, or mark Inform-A-Gram No. P30.

CAM milling/JIG boring

A SPECIALIZED CAM MILLING SERVICE, JIG BORING, SPOT WELDING, CONTRACT PRODUCTION

EXPERIMENTAL DEVELOPMENT

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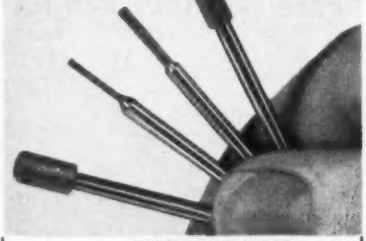
EISLER ENGINEERING CO., INC.
Chas. Eisler, Jr., President
732 So. 13th St
Newark 3, N. J.

CIRCLE INFORM-A-GRAM KEY NO. 1222



New CHROME-LOK DIAMOND PINS...

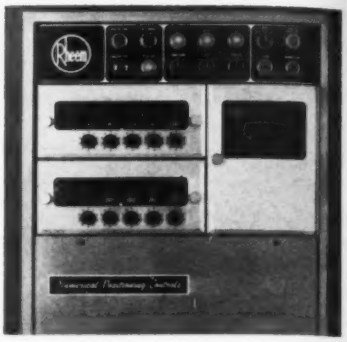
25 Sizes in 0.010 increments, from as small as 0.020 to 0.500" offer a low cost solution to precision jig and internal grinding of small holes. Diamond grains are permanently surface bonded to a tool steel shaft by an exclusive Chrome-Lok process for maximum strength, precision and tool life. Two grit sizes—80/100 for faster metal removal; 200/240 for finishing —all with cylindrical heads.
Write today for complete information.
Dealer Inquiries Invited

TITAN TOOL SUPPLY CO.
Box L, 1419 Hertel Ave., Buffalo 16, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1223

Photocell Reader

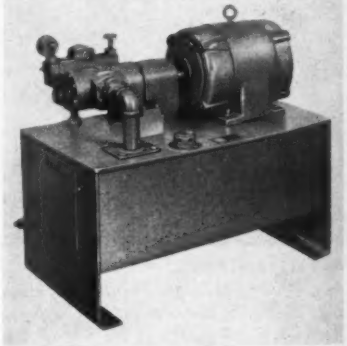
Originally designed for use with Rheem's advanced numerical positioning controls for machine tools, the reader is now available for punched tape reading. Transistorized for long life, the sensing element is one piece of silicon with eight information signals and one timing track channel. Focusing problems, often encountered with a separate photocell for each



channel, are eliminated. Reading speed is 100 characters/sec, according to Rheem Mfg. Co., Electronics Div., 5200 W. 104th St., Los Angeles, Calif. Inform-A-Gram No. P31.

Double Pump Units

New 1000 to 2000 psi double pump units require low horsepower, have low oil temperatures, and operate at maximum circuit efficiency. Hannifin Co., 501 S. Wolf Rd., Des Plaines, Ill., manufactured the pumps on a double basis with the "Hi-Lo" unloading valve panel. For rapid advance



and slow and constant feed, these units are offered in standard 30 to 60 gal reservoir sizes, with combined capacities to 33 gpm. All units have an 1800 rpm motor. Inform-A-Gram No. P32.

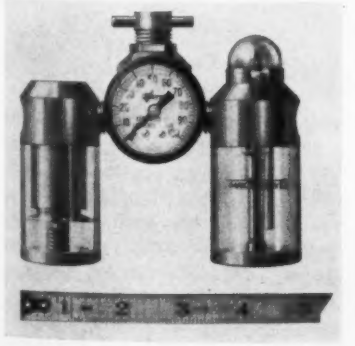
Product News

Highly Accurate Collet Chuck

Model 501 collet chuck spans the entire range from 1⅝ to ¼". Introduced by Erickson Tool Co., Solon, Ohio, the special chuck uses standard 500 series collets. Two special insert noses also allow use of 100 and 400 series collets, in size ranges from ¼ to 1". The standard hardened-steel collets are double-angled and slotted at both ends. Collets are collapsible due to two camming surfaces, which allow the collet to grip drills and end mills on their flutes, as well as on straight shanks. Collets are self-mark Inform-A-Gram No. P33.

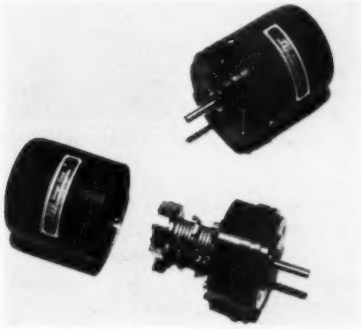
Filter-Regulator-Lubricator

Designed for limited space applications or low flow requirements, a new miniature filter-regulator-lubricator assembly in ⅛ and ¼" size with maximum pressure of 150 psi is available. Made by Watts Regulator Co., Lawrence, Mass., the filter features a 20 micron porous bronze element. Write the manufacturer, or mark Inform-A-Gram No. P34.

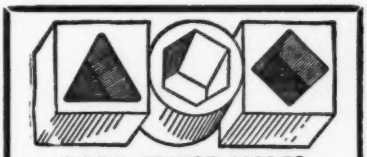


Precision Rotation

A precision limit stop assembly provides fully adjustable rotational limit control within an operation range of 30 to 4530°. By PIC Design Corp., 477 Atlantic Ave., East Rockaway, N.Y., the self-contained assembly is available



from stock in a 3/16" shaft size adjustable through a series of washers, each governing 300° of rotation. The limit stop assembly can be pre-set to a specified stop. More about this from the makers, or through Inform-A-Gram No. P35.



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No distortion — even on ⅛" stock! MODEL "C"

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For small production runs on ⅛" to 1" stock. Exclusive screw design gives perfect knurl pattern. Furnished with 3 hardened straight or diamond pattern knurls of standard ½" dia. Forged steel frame is self-centering. Write for illustrated folder.

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CIRCLE INFORM-A-GRAM KEY NO. 1232

Gaertner Toolmakers' Microscope used to measure typical piece part. Co-ordinate range 4" x 2".

Precise measurement to 0.0001" and 1 min. of arc

Gaertner Toolmakers' Microscope

Here is a reliable, easy-to-use microscope for precise measurement of piece parts, tools, dies, thread gages, templates, jigs, fixtures, etc. Ideally suited for making a wide variety of precision measurements and is especially valuable in reducing rejects in production work.

With the Gaertner Toolmakers' Microscope you make direct, non-destructive measurements — no contact, no distortion, images are sharp and clear. It is a basic measuring instrument for inspection depts., gage labs, tool and die and model shops, industrial and research labs.

The Gaertner Toolmakers' Microscope has been proven in use by U. S. Government Gage Laboratories, and by prime contractors and their subcontractors. With all parties using the same measuring instrument, inspection procedures are co-ordinated and disagreements and rejects minimized.

Features that help you get
HIGH SETTING AND REPEATING ACCURACY

- Low, compact built-in rotary stage reads to 1 minute of arc throughout 360° range.
- Minimum overhang of stages.
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Features that assure you of
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- Convenient location of ocular eyepieces for ease of reading.
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Modifications and accessories to
MEET YOUR EXACT REQUIREMENTS

- Thread and radius templates, camera and spotting attachments, fine motion focus, variable magnification available.
- If you have a special measuring problem, our staff of representatives will be happy to consult with you. The service and engineering facilities of the manufacturer are always immediately available to help you.

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The Gaertner Scientific Corporation

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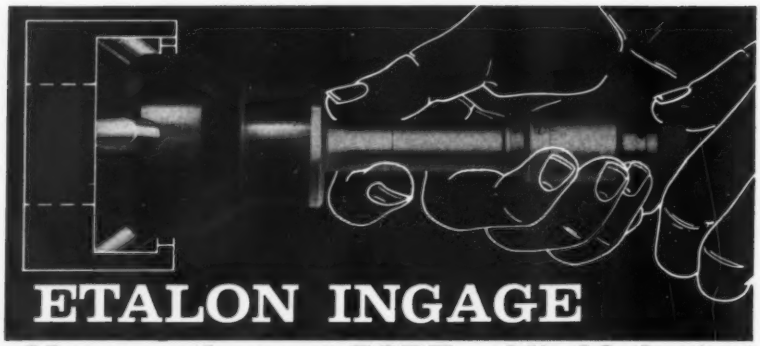
CIRCLE INFORM-A-GRAM KEY NO. 1233



Measures the exact BORE or blind hole size!
Reading .0001" Size: 3/16" to 4"

Takes accurate measurements of blind holes. No master — measures directly—by .0001". Automatic alignment, rectangular contact points guarantee extreme accuracy even when fully extended. Immediately detects out of round holes; with extensions measures holes up to 30" deep. Hardened contact points exert minimum pressure — will not damage fragile work.

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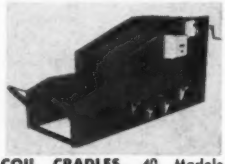
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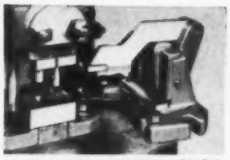
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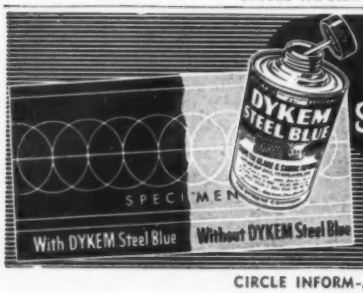

DYKEM STEEL BLUE
Stops Losses
making Dies and Templates

Popular package 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.

Write for sample on company letterhead
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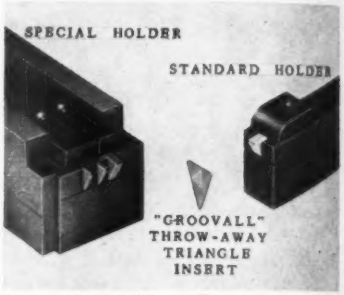
CIRCLE INFORM-A-GRAM KEY NO. 1243

Product News

Special Holder

A new holder, known as "Groovall," has aroused enthusiasm among users. They report time savings for set-up and tool change, higher production, less scrap, more cuts per machine station, and greater accuracy. The holder uses "Groovall" throw-away triangle inserts. The manufacturer — U.S. Tool & Cutter Co., 28975 Orchard Lake Rd., Franklin, Mich.—claims that clamps are used for safety's sake, but that the entire pressure of the cut is absorbed by the geometry of the tool. The throw-



away triangles allow top rake, necessary in machining aluminum. The maker will supply more data, or Circle Inform-A-Gram No. P36.

Vibration Pickup System

A new vibration pickup system, Type 1560-P11, converts the sound-level meter to a special purpose vibration meter. The instrument's accelerometer serves as an accessory input transducer for the sound level meter, while the control box

complements the electrical characteristics of the pickup. According to General Radio Co., West Concord, Mass., safe operating temperature extends from 0 to 200°F. Over the temperature ranges of 30 to 180°F, sensitivity remains constant within ±10%. Circle Inform-A-Gram No. P37.

Product News

Quick Adjusting Air Regulator

A lever and coarse screw have replaced the standard fine thread and tee-handle type adjustment screw in a new quick-adjusting air regulator introduced by Wilkerson Corp., 1640 West Girard Ave., Englewood, Colo. Maximum primary (inlet) pressure is 300 psi and maximum secondary (outlet) pressure of standard unit is 125 psi. Internal metal parts are brass, and external ones are die cast of zamak. Check with the manufacturer or circle No. P38.

Expanding Mandrel

A new expanding mandrel for winding and unwinding rolls of paper, paperboard, plastic films, rubber, foils, textiles, wire mesh, etc. features rubber tires. Connected in series by hose to a source

of air pressure at one end, the tires are deflated when the mandrel is inserted into a roll core for winding or rewinding of material. Once in place, pressure is applied to inflate tires and the core is gripped firmly. Size range is for 8 to 24" core ID, length to specification. The tires can be moved along the shaft to adjust for core lengths, according to Perfection Tool & Mfg., Inc., 209 Baldwin Rd., Kalamazoo, Mich. Circle No. P39.

Baldy sez... There's no error due to distortion in BALD EAGLE Magnetic Sine Tools.

Model 1905M

This compound angle sine plate has dual field permanent magnetic chucks that can be magnetized independently, a positive lock on each axis, and a center T slot. Like all BALD EAGLE Sine Tools, it's accurate to .0002" in dimensions and parallelisms. Other models include 5" and 10" Sine Bars and Sine Plates, single and compound, plain and magnetic.

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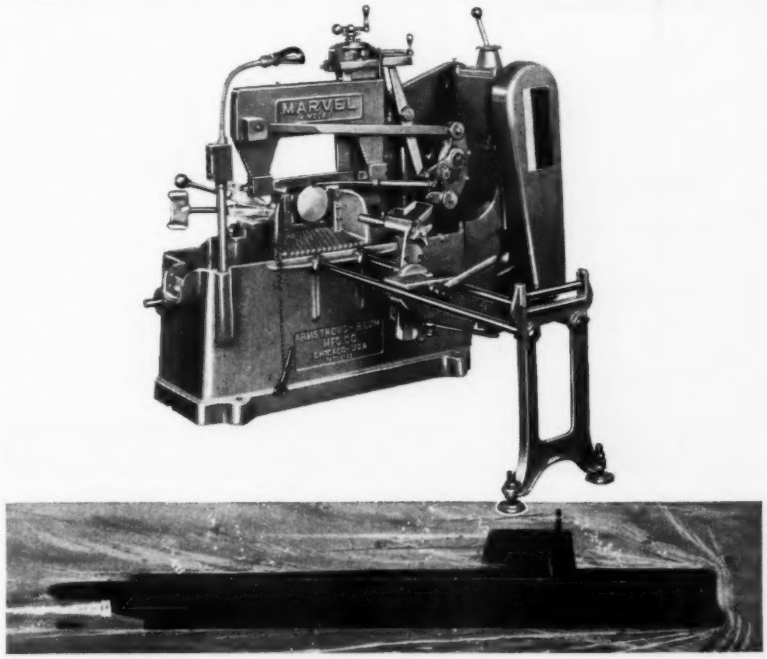
CIRCLE INFORM-A-GRAM KEY NO. 1252



OBSOLETE ?

Emphatically no—not when a Marvel Hack Saw like this one can cut 4600 blanks of 3¼" round 303 stainless steel for just 1½ cents blade cost per cut—not when these 4600 blanks were cut-off at the rate of 20 pieces per hour, floor to floor! And this is typical production performance at that.

Obsolete? This Marvel Hack Saw Machine is as modern in performance as the next atomic powered submarine that will slide down the ways!

If you want faster cutting, the Marvel Hack Saw has speed to spare; accuracy of cut is assured by the rugged construction of the machine itself; blade cost, in many cases is less than 1¢ per cut.

When you consider these advantages and their low initial cost, Marvel No. 6 and No. 9 Series High Speed Heavy Duty Ball Bearing Hack Saws, as we build them, are your best cutting-off equipment buy today.

We can prove our point by demonstrating Marvel Sawing efficiency on your own work, without any obligation on your part. Because we have consistently built both Hack Saws and Band Saws for more than 40 years, we will give you an unbiased recommendation.

Catalog C-60 illustrates and describes the complete line of Marvel Sawing Machines. Write for your copy.

MARVEL Metal Cutting SAWS BETTER MACHINES BETTER BLADES

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NEW RANGE OF SIZES

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SMALL BORE GAGE

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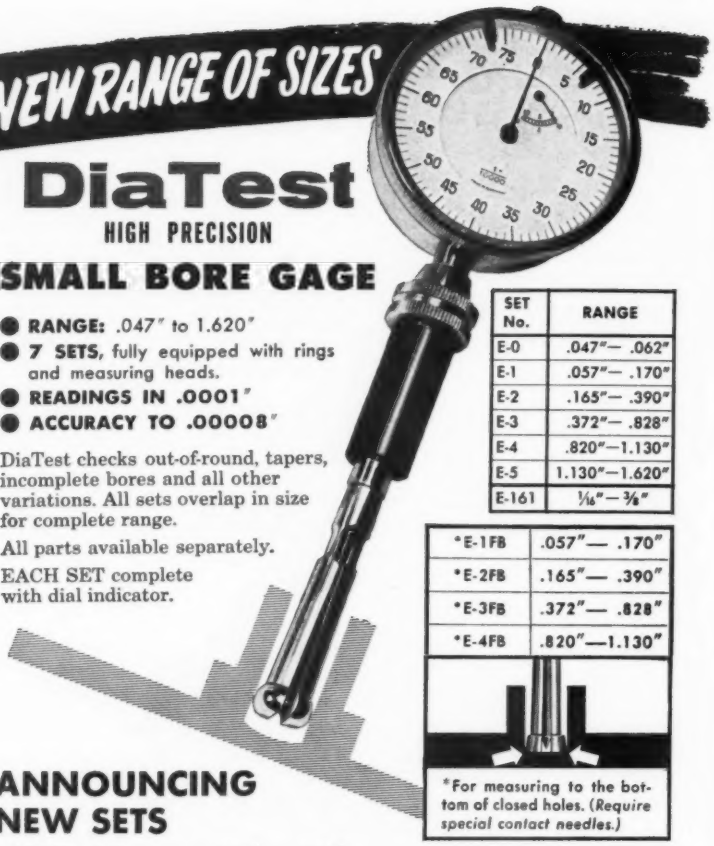
- **ACCURACY TO .00008"**

DiaTest checks out-of-round, tapers, incomplete bores and all other variations. All sets overlap in size for complete range.

All parts available separately.

EACH SET complete with dial indicator.



SET No.	RANGE
E-0	.047"— .062"
E-1	.057"— .170"
E-2	.165"— .390"
E-3	.372"— .828"
E-4	.820"—1.130"
E-5	1.130"—1.620"
E-161	1/16"—3/8"

*E-1FB	.057"— .170"
*E-2FB	.165"— .390"
*E-3FB	.372"— .828"
*E-4FB	.820"—1.130"

*For measuring to the bottom of closed holes. (*Require special contact needles.*)

ANNOUNCING NEW SETS

- **SET No. E-0:** Range .047" to .062"
- **SET No. E-5:** Range 1.130" to 1.620"
- **SET No. E-161:** Nominal Range, 1/16" to 3/8" *(A "fractional" set, in increments of 1/16")*

RIGHT-ANGLE ATTACHMENT, EXTENSION RODS, AND DEPTH ADJUSTER ACCESSORIES ARE INTERCHANGEABLE.

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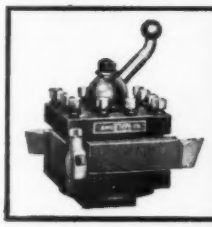
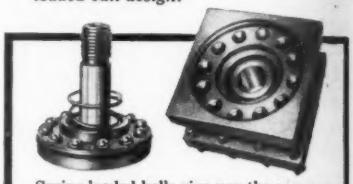
CIRCLE INFORM-A-GRAM KEY NO. 1262

Enco Turrets Assure ±.0005" Accuracy



by being on the ball!

Enco's passion for exacting accuracy is paying off in metal working operations everywhere! Combining precision lathe output with efficiency and economy has become a necessity . . . and Enco turrets have proved the ideal answer. An Enco turret transforms one lathe into a production machine, each operation of unsurpassed accuracy due to *spring loaded ball design!*



Spring loaded balls give you the accuracy you want! Hardened steel precision balls locked between accurately milled spherical seats consistently give accuracy in re-indexing. Hardened all steel construction minimizes wear, retains built in precision.

Also Mfrs. of Enco Hexturret Bed Turrets

Write today for catalog No. 53.

There's an ENCO turret for every lathe.

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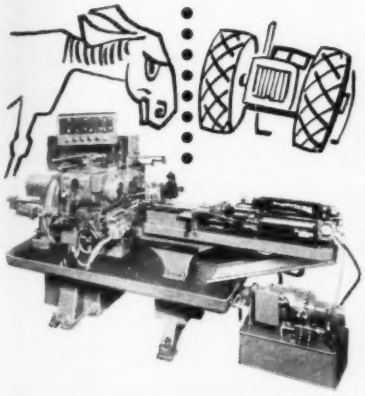
Transform your stubborn mule to a prime mover



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TURRET LATHE AUTOMATION
by Acme
HYDRIVE

Hydrive transforms older turret lathes from limiting factors to high volume producers! Technical management is being stimulated to machine tool re-evaluation in view of the proved success of automating turret lathes with Hydrive. Stepping up manual turret lathes to automatic operation—easily capable of tripling output—will multiply your capacity at surprisingly low cost. Without the substantial expenditure of new equipment, management reaches increased production goals . . . with wanted accuracy and reliability.

Write today for complete Hydrive information . . . how Hydrive will make your turret lathe far more productive. Also available upon request, FREE Hydrive film.

ACME INDUSTRIAL COMPANY
204 North Laflin, Chicago 7, Ill.
CIRCLE INFORM-A-GRAM KEY NO. 1271

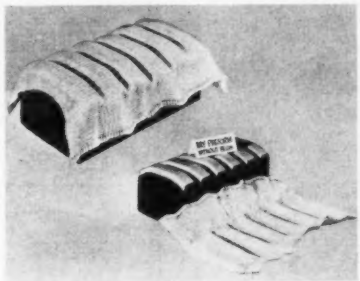
Product News

Lead Screw Tapping Head

Model 2LS "Auto-tap," is a new lead screw tapping head that fits any drill press. Introduced by Ettco Tool & Machine Co., 594 Johnson Ave., Brooklyn 37, N.Y., the tool features actuating lever, stop and depth control as part of its design. The hardened, precision-ground lead screw carries the thrust while the tap cuts the thread. Even unskilled operators can produce precision tapped holes, increase production rates and reduce tap breakage. More from the maker, or through Inform-A-Gram No. P40.

Unique Fiberglass Cloth

Faster laminating, fewer layers at low cost, and less interlamination residual stresses in sharp contour laminates, are all credited to a new uniquely woven fiberglass cloth. Drapeze 391 is used for close



tolerance plastic tooling, patterns and equipment, boat construction, critical reinforced plastic parts and structures of all types. Write to Rezolin, Inc., 1651 18th St., Santa Monica, Calif., or circle Inform-A-Gram No. P41.

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Lepel induction heating equipment is the most practical and efficient source of heat developed for numerous industrial applications

Typical Induction Heating Applications

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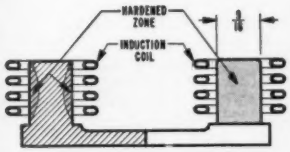
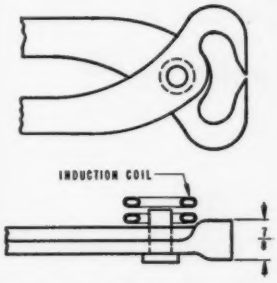


Bosses on part shown are locally hardened to increase resistance to wear and plastic yielding. Surface hardening by induction provides hardness pattern indicated and hardness of Rc 57/59 for 1040 steel when quenched in water.

Our engineers will process your work samples and return the completed job with full data and recommendations without cost or obligation.

Hot Forming Aids Production Assembly of Nippers



The ends of high-strength steel rivets are selectively heated to 1700° F for hot upsetting. Design of coil permits movement of upsetting tool through the coil.

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CIRCLE INFORM-A-GRAM KEY NO. 1272

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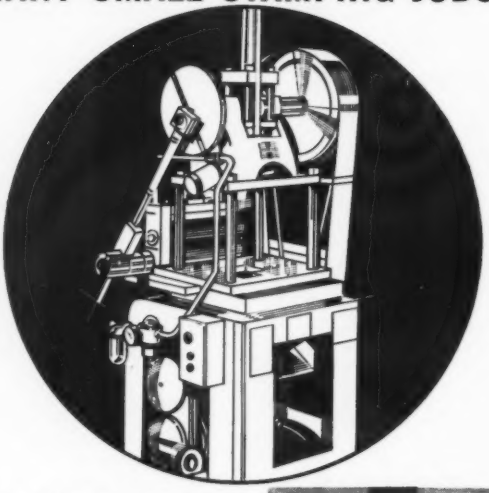

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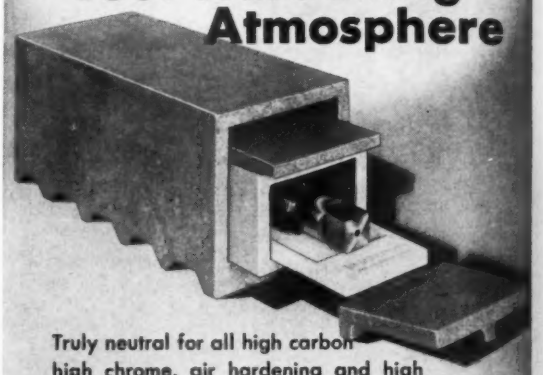

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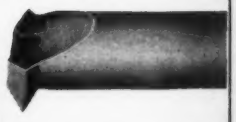

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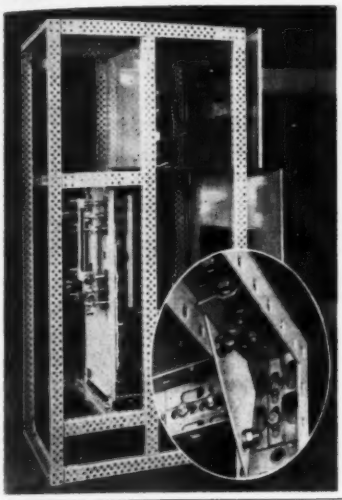
CIRCLE INFORM-A-GRAM KEY NO. 1284

Product News

Structural Framing

A new structural framing system features a unique recurring pattern or round and square holes in a basic 3 x 1½", 11 gage channel. Developed by Lake Shore Electric Corp., 205 Willis St., Bedford, Ohio, the design incorporates square neck carriage bolts with square holes for rigidity. Flathead bolts are included for flush fastening in countersunk holes where panel covers are to be added. Standard channel lengths with structural brackets permit framing up to 10 ft square and 10 ft high. Basic channel can be assembled with ordinary hand tools into any enclosure configuration, with five formed structural members. These include long- and short-leg 90° angle brackets; a 45° angle bracket; a 90° gusset plate; a flat butt plate, and a flat "T" plate. Inform-A-Gram No. P42.



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Automatic control by tape of the depth of cut of each spindle, rapid traverse lengths, selection of feeds and speeds is now optional on all Burgmaster 6- and 8-spindle tape controlled turret drilling machines. The 3-axis tape control system provides fully automatic machining with X-Y axis table positioning and simultaneous Z-axis control of tool penetration to suit the individual operation of each spindle. The automatic depth control feature must be ordered at machine purchase time and is offered in a wide selection of available 3-axis systems. Write Burg Tool Mfg. Co., Inc., 15001 So. Figueroa St., Gardena, Calif., or check Inform-A-Gram No. P43.

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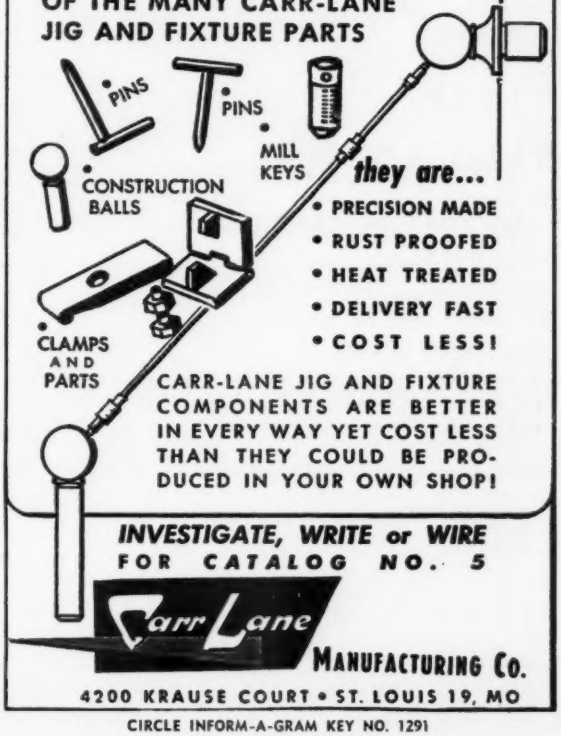

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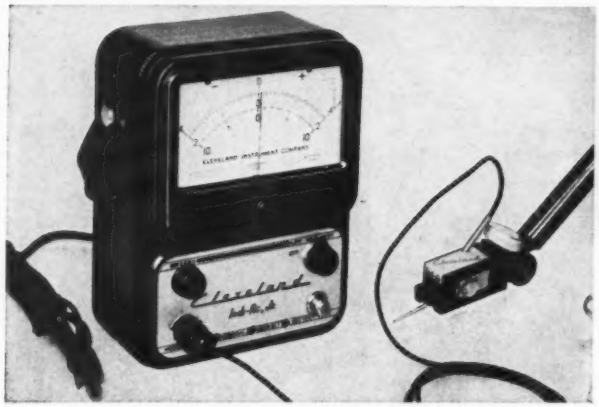

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CIRCLE INFORM-A-GRAM KEY NO. 1301

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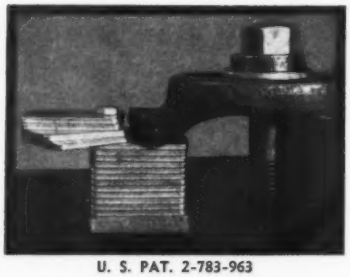

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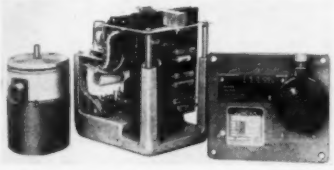
CIRCLE INFORM-A-GRAM KEY NO. 1302

Product News

Precision Tooling Instruments

Gem Center Scope, a new close tolerance instrument of unbreakable optical plastic is used to find center for drilling precision holes. It is equally well suited for inspection and other tooling applications. Accurate to 0.001″ with 6.00 power magnification, the instrument can be combined with Scribe Rite. As a team Scribe Rite and Gem Center Scope work ideally on exacting templates, precise layout lines, lofting, layout of large drill plates and fixtures, extension and transfer of scribed lines, etc. Write Tool Components, Inc., 12923 Budlong Ave., Gardena, Calif., or P44.

Accurate Position Control



A new position control HA-50 includes a combination actuator and sensor, a solid state printed circuit amplifier, and the digital readout position setter. The amplifier may drive a standard Jordan Shaftrol rotary actuator or Lineatrol linear actuator. Amplifier output may be solid state or from relays. A crossover circuit provides fast traverse and transfer to slower speed as preset position is approached. In a typical machine tool application, setting to 0.001″ is provided over 30″ travel. Similar systems, with higher or lower accuracies, are used for valve positioning, variable speed drive control, process or programming control. Full information is given in new Jordan specification sheets. Write Jordan Controls, Inc., 3235 W. Hampton Ave., Milwaukee 9, Wis., or circle No. P45.

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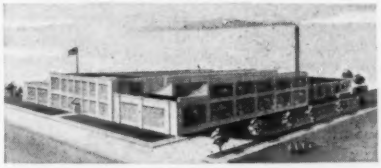
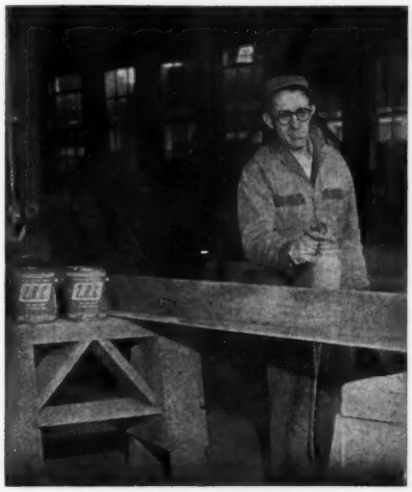


COLUMBUS DIE-TOOL & MACHINE CO.
P. O. BOX 750 • COLUMBUS, OHIO
CIRCLE INFORM-A-GRAM KEY NO. 1311

GALVANIZE with Z. R. C.®



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Easy to apply by brush, spray or dip!

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nuclear equipment
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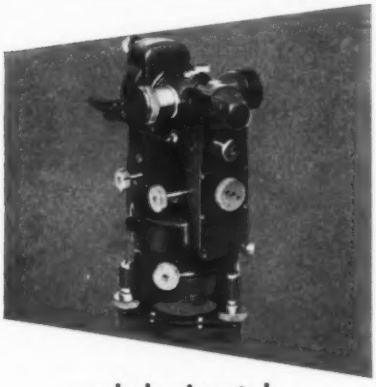

reads horizontal and vertical angles direct to 1 second of arc . . .

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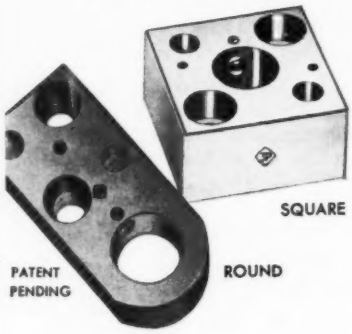
3P
Kwik-Pull RETAINERS

for BAL-LOK PUNCHES . . . DIE BUTTONS



The new, improved 3P KWIK-PULL Bal-Lok Retainer is designed for easy removal. Ordinary standard screws, serving as jack screws, quickly demount the new 3P Retainers from position on dowel pins. Saves time, eliminates possible damage to retainers and die. Write for 3P Catalogue No. 200.

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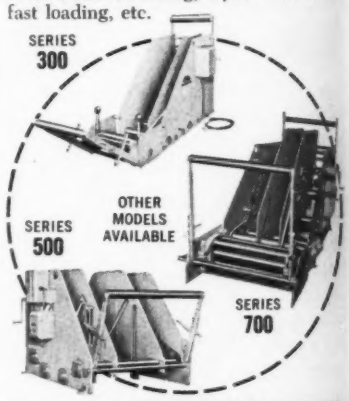

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Product News

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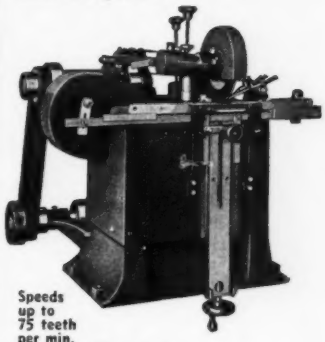

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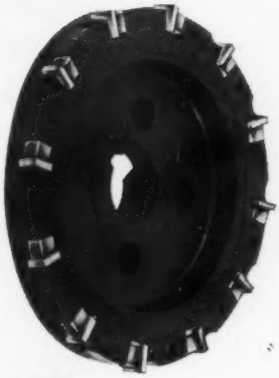

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The Rotor Tool Company, 26329 Lakeland Boulevard, Cleveland 32, Ohio. Subsidiary of The Cooper-Bessemer Corp.

ROTOR TOOLS

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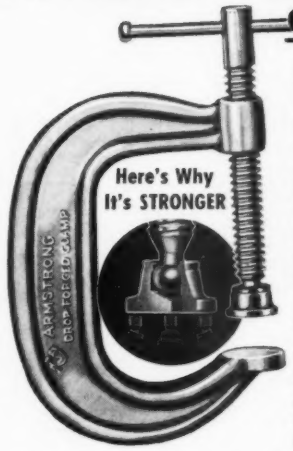
New ARMSTRONG Swivel Pad can't come off



Now ARMSTRONG deep throat "C" Clamps have the new (Pat. apd. for) ARMSTRONG Ball-joint Swivel Pad. This "C" Clamp pad, developed by ARMSTRONG Engineers, is tougher than any on the market. Rigorous testing in our own plant first proved this fact, and field tests in factories throughout the country have confirmed our own test results.

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This wall of steel makes it impossible for the pad to come off the screw during normal use. In fact, our tests have proved that it is virtually impossible to intentionally knock the pad off with a hammer—yet the pad is free to swivel through an arc of approximately 40°.

Call your ARMSTRONG Distributor

Your ARMSTRONG Distributor can offer delivery from stock on this "400-Series" deep throat, drop-forged "C" Clamp with the new Ball-joint Swivel Pad. He also carries in stock the other styles of clamps in the ARMSTRONG Line—the broadest line of drop forged "C" Clamps.

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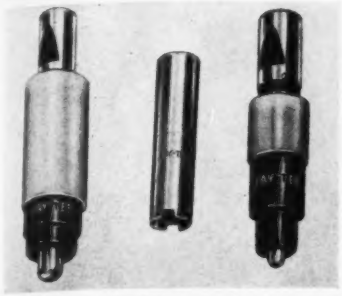
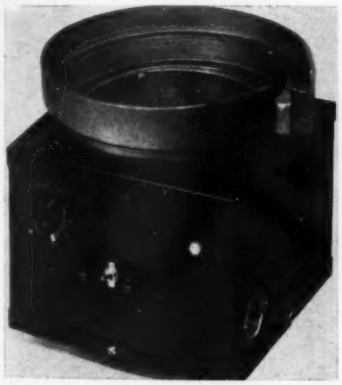
Product News

Staking Tools



Jay-Tee Staking tools now incorporate a built-in "pilot" pin made slightly oversize, permitting it to be turned down to fit the ID of the work. Result is perfect alignment of the original setup. The Jay-Tee staker is standardized and makes procurement of staking tools no more complicated than ordering twist drills or hacksaw blades. Parts are precision machined and ground to close tolerances to maintain uniform and accurate performance, producing neat, perfectly seated, firmly bonded, symmetrical assembly. Write Jay-Tee Mfg. Co., 1515 N. 25th Ave., Melrose Park, Ill., or circle Inform-A-Gram No. P47.

Vibratory Parts Feeder



The new Elk-O-Matic vibratory parts feeder for oriented position feeding is equipped with instantaneous rate flow control. Made by Elk Engineering Works, St. Marys, Pa., the Elk-O-Matic does the work of many hands by providing automatic, oriented position, single line feeding parts to various automatic machines. Gentle vibrations direct even hard-to-flow parts freely. Complete information available from the manufacturer, or by circling No. P48.

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USE IT EITHER WAY

Full 1/3 h.p. G. E. Motor

At last, a top quality industrial sander that provides all the most wanted features — yet sells for so little.

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Illustrated Literature on Request

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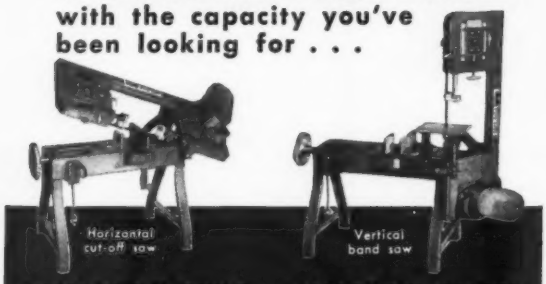
DOYLESTOWN, PENNSYLVANIA

CIRCLE INFORM-A-GRAM KEY NO. 1353

The New WELLS MODEL 58-B

A CONVERTIBLE BAND SAW

with the capacity you've been looking for . . .



COMPACTLY BUILT • MODESTLY PRICED

Here's the all new Wells Model 58-B . . . a metal saw designed and built for double duty—double value. It's a compact, rugged, well guarded, extremely versatile unit . . . economically priced. As a horizontal cut-off saw, Model 58-B features quick-action vise (swivels to 45°); automatic shut-off; adjustable guides. Capacity: 6" x 10" rectangular shapes; 6" dia. rounds. For vertical use, swing head to upright position and install work table. Optional wheel-handle unit provides complete mobility. Write for complete information.

The Pioneers of Horizontal

Wells

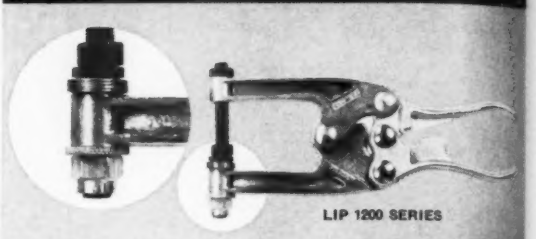
METAL CUTTING BAND SAWS

WELLS MANUFACTURING CORPORATION

1940 Cedar Street, Three Rivers, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 1361

NEW *KNU-VISE* LOAD INDICATING PLIERS GUARANTEE CLAMPING FORCE



These pliers are for applications where it is essential, and often critically so, that a certain clamping force be applied time after time—*regardless of the thickness of the work.*

In use, the adjusting spindle is set for the desired clamping force by trial clamping. When the proper force is obtained, the self-locking nut on the anvil is then adjusted so that the LOAD INDICATING WASHER moves "just smoothly" with the plier clamped on the work. Thus, once a certain clamping force has been established it can be readily duplicated on any other work thickness simply by adjusting the spindle so that the LOAD INDICATING WASHER again moves "just smoothly" after clamping.

Write for complete information on this time-saving model.

Manufacturers of over 150 models of manually and air-operated clamps and pliers

KNU-VISE PRODUCTS | LAPEER MANUFACTURING CO.

3064 DAVISON ROAD
LAPEER, MICHIGAN

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4436 Long Beach Ave., Los Angeles 58, Calif., ADams 3-7148

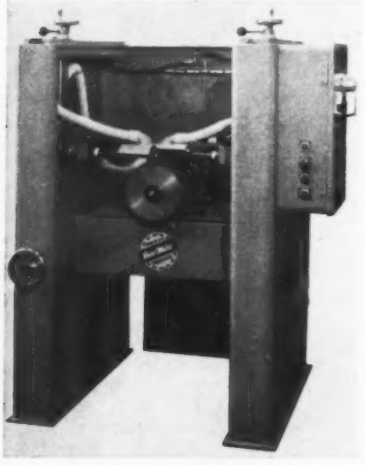
CANADIAN DIV.: HIGGINSON EQUIP. SALES LTD.
1131 Pettit Road, Burlington, Ontario

CIRCLE INFORM-A-GRAM KEY NO. 1362

Product News

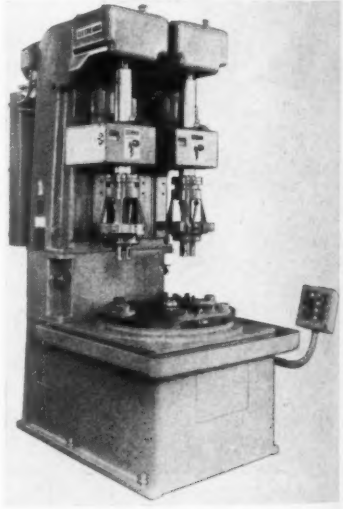
Deburring Machine

Deburring, once a tedious process, can now be done in minutes instead of hours. Davis & Thompson Co., 4460 N. 24th St., Milwaukee, Wis., incorporates many new features in the Roto-Matic deburring machine. Great time savers are a floating grinding wheel spindle that follows the gear teeth contour and eliminates filing and use of hand wheels. The machine's two floating arms deburr both ends of teeth simultaneously, and complete operation after one revolution. The machine is not completely enclosed and this allows for free movement of work pieces. For more information on the ¼-hp variable speed, electronically-controlled deburring machine, write the manufacturer or circle Inform-A-Gram No. P49.



Drilling and Tapping Machine

The touch of a button evokes an automatic cycle, producing a drilled and tapped hole without further operator work. Easy set-up, pick-off change gears, broad ranges of speeds, feeds and tap leads, make the Cleereman 2-spindle drilling and tapping machine ideal for small lot or production runs. Two or more columns are mounted on a special base. High production is obtained with rotary index tables. Building block construction requires low initial investment on basic elements for change to new parts. Write Jackson-Fotch Co., 7350 W. Lawrence Ave., Chicago 33, Ill., or Circle Inform-A-Gram No. P50.



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ERICKSON INSERTED BLADE

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Exclusive Erickson method of grinding cutting angles gives Freer Cutting Action since end pressures are reduced.

"Heeling" eliminated.

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Restores Original Factory Grind eliminating biggest obstacle to use of Spade Drills.

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A-3124A

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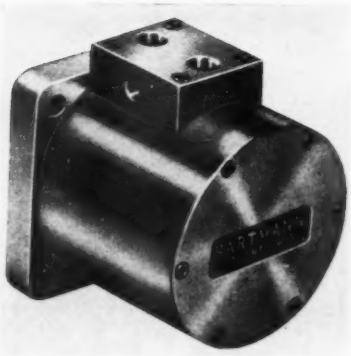
CIRCLE INFORM-A-GRAM KEY NO. 137

Product News

Rotating Vane Hydraulic Motor

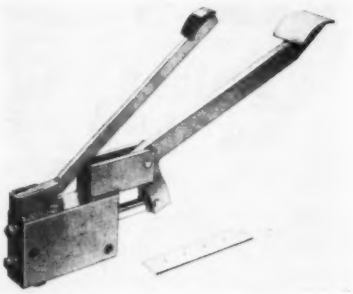
"Rol-Vane" is the name of a new constant displacement motor, introduced by Hartmann Mfg. Co., 1637 Goold St., Racine, Wis. The hydraulic motor is particularly designed for precision machine tools and equipment. It features smooth, pulseless, noiseless operation even



at extremely low speed, and provides practically 100% torque at stall and infinitely variable speed. Completely self-contained and easy to install, it can be connected directly to load. Rol-Vane hydraulic motors are available in three sizes and displacements range from 2.2 to 7.6 cu in rev. Torque is 35 to 121″/100 psi. The motors are designed for maximum speeds up to 1500 rpm, and pressure maximum of 2000 psi. Inform-A-Gram No. P51.

Hydraulic Foot Pump

A compact, simple hydraulic foot pump is said to be easily adaptable to a wide range of applications in the commercial, automotive, and aeronautical fields. The midget pump (only 1¼″ thick) is available in various models providing working pressures from 100 to 10,000 psi. Release pressure valve or any desired control is available. The pump makes foot-



controlled hydraulic power available and practical where the operator needs both hands free. The pump can operate lift tables or hold fixtures, and can be used to test pressure tanks. For more production or laboratory applications write Lange Lift Co., 4225 N. 124 St., Milwaukee 22, Wis., or mark Inform-A-Gram No. P52.

THESE BENEFITS ARE YOURS

when your drills are sharpened on

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- ... extremely true, close-tolerance holes within .001 of drill size (even in the new super-metals) since drill points are concentric within .0002.
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- ... increased production from every drill because drills last up to twice as long.
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Get these benefits... and many more with the completely automatic WINSLO-MATIC DRILL POINTER. Handles drills from 1/32″ to 1½″ diameters.

Write for descriptive literature and check for yourself the many exclusive advantages of the versatile WINSLO-MATIC Drill Pointer.

Winslow PRODUCT ENGINEERING CORPORATION
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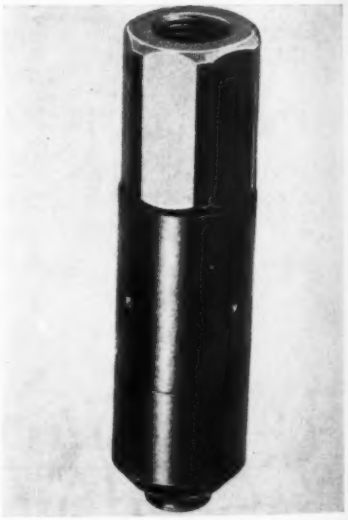
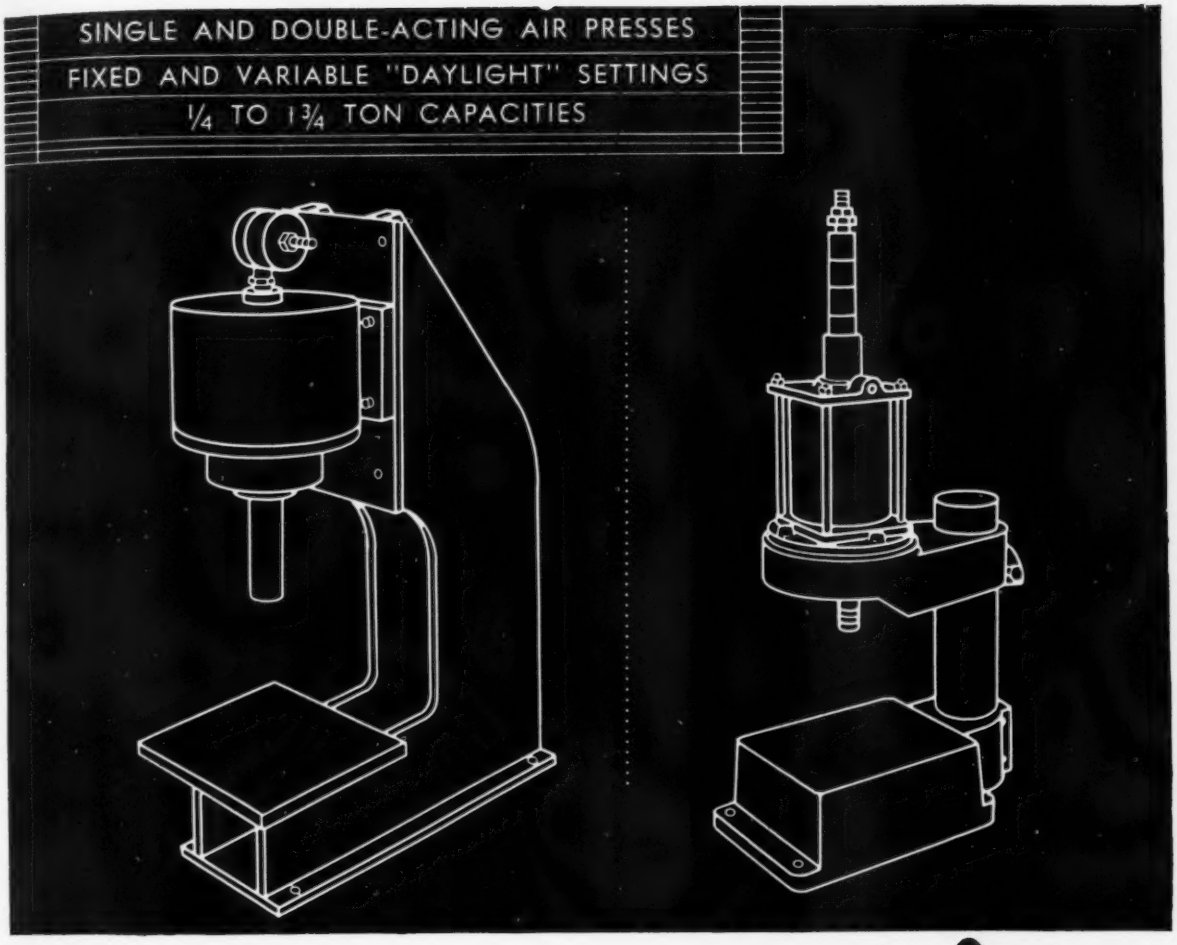
CIRCLE INFORM-A-GRAM KEY NO. 1381

Air Control Valve

A new recycling poppet valve by Novi-Matic, Div. Novi Tool & Machine Co., Novi, Mich., releases air quickly and completely. The poppet valve can be reseated while the plunger remains depressed.



The Novi-Matic bleeder poppet valve is used primarily for actuating 4-way bleeder air control valves. Write the manufacturer, or circle Inform-A-Gram No. P53.



How MEAD air presses put the SQUEEZE on production costs

Fast-acting MEAD bench presses put new economy into a wide variety of everyday operations like assembling, staking, crimping and riveting. The broad line of MEAD air actuated models covers virtually all small press requirements. Press capacities begin at ¼ ton and grow to 1¾ tons by fractional increments. The sturdily designed double or single-acting operating cylinders may be mounted in one of three fixed positions on a rigid plate, as shown on the above left. The picture on the right shows how a cylinder may be attached to a solid steel column for vertical or radial movement. To press more profit out of your production, check with MEAD.

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CIRCLE INFORM-A-GRAM KEY NO. 139

Function Factor formula developed to assess working quality of thread-cutting screws

Unbiased laboratory tests demonstrate superior performance of Parker-Kalon thread-cutting screws in cast iron, steel, aluminum and plastics.

To compare the actual working quality of thread-cutting screws under laboratory conditions, a series of simple yet thoroughly dependable tests were made using P-K Types "F" and "B-F" and competitive thread-cutting screws. These tests can be easily duplicated by any engineering department that would like to determine their own results.

The test was based on the premise that (1) the better a screw resists failure after being driven home, the stronger the assembly, (2) the easier the screw is to drive, the less wear there will be on driving tools and upon the operator and (3) thread failures either on the screw or in the work, gives rise to costly, time-consuming salvage operations as well as other intangible production costs.

Thus, a measure of evaluating the performance of thread-cutting screws is the ease of driving combined with the degree of resistance to fastener failure. The relationship between these two functions is referred to as "drive-strip ratio."

How the tests were conducted

Random sizes of samples purchased on the open market from a variety of sources (including the P-K Types "F" and "B-F") were identified solely by letters. Manufacturer's names were not revealed to the technicians who were responsible for making the investigation.

As a means of fairly evaluating the performance of the screws, they were applied under identical conditions in sections of cold rolled steel, cast iron, aluminum castings and general purpose plastics. Similarly, hole sizes as well as depth of penetration of the screws were identical.

Each screw was driven by a specially designed Detroit torque testing machine.

To limit and control depth of penetration, washers were placed under the screw heads. Screws were inserted in the hole in the part (steel, cast iron, aluminum, plastic) and the part placed in the jaws of the machine. The screw was driven until it cut a full depth thread. The maximum driving torque was recorded at this point.

Failure Point The second phase of the test was to determine the amont of torque which could be applied to the fastener before (1) the screw failed in section or (2) when the screw failed in the engagement material. This failure point was then recorded in inch-pounds, whereupon a direct comparison of the several screws could be made.

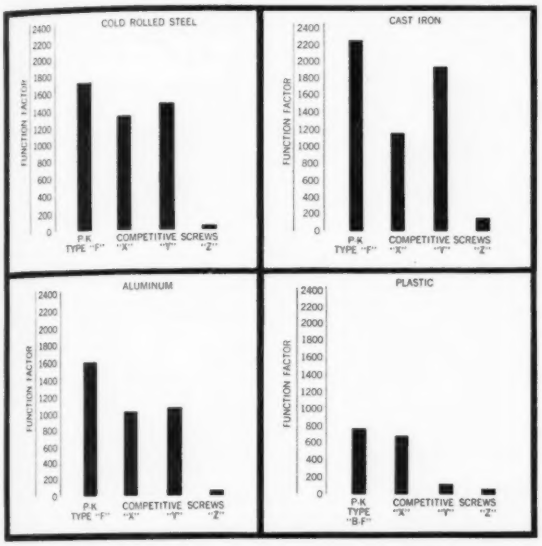
Function Factor In order to assess the working qualities of each screw that was tested, a formula was devised that would express these functions. DRIVE TORQUE was the average of driving torque values obtained from individually running a given number of screws in the application. STRIP TORQUE was the average of a given number of strip torque values obtained from the ultimate failure of the screws in section or of the threads in application.

Formula The formula is expressed as

$$\text{Function Factor} = \frac{(\text{Strip Torque})^2}{\text{Drive Torque}}$$

P-K® thread-cutting screws average 108% better working qualities than the 3 competitive types tested.

Charts shown are typical samples and represent in each case only one of the many tests run on each screw. Identification of screws tested was made only upon completion of test.



Designed to reduce pressure development in the engaging section by as much as 80%, P-K Types "F" and "B-F" thread-cutting screws are manufactured with five cutting flutes. The completely formed threads have sharper cutting edges and flutes are of continuous depth.

Lower Drive Torque

Together these new P-K features make for better clearance of the accumulated material and *assure lower drive torque*. They also sharply reduce the possibility of stripping, galling and other causes of screw failure.

Use Recommendations

P-K TYPE "F"

P-K TYPE F The new, improved P-K Type F (Patented), is a hardened thread-cutting screw developed for use in granular or brittle materials such as ferrous or non-ferrous castings and bronze or brass forgings. It may also be used advantageously in structural steel and sheet metals when it reduces driving torque and resists shear and tension loads and in impregnated plywoods where it grips with rugged strength. The pilot with its five tapping flutes cuts a machine thread as the screw is turned in—does the job with complete dependability—stays tight and secure.

P-K TYPE "B-F"

P-K TYPE B-F For plastics, P-K recommends the new improved "Pentap", Type B-F (Patented). This exceptionally efficient thread-cutting screw combines the five thread-cutting flutes of the P-K Type F with the coarse-pitch, widely-spaced threads of the P-K Type B screw. Thus it distributes cutting pressure evenly, lets chips drop to the bottom of the hole and prevents cracking of the material. The B-F is designed for making fastenings to comparatively thin sections and bosses in friable and brittle plastics.

SPECIAL FOR NYLON P-K TYPE L

P-K TYPE "L"

For this very popular material, only Parker-Kalon has a completely new tapping screw—especially developed for use in nylon. It is called the P-K Type L (U.S. Patent 2,350,346). The Type L functions as a combination thread-cutting and thread-forming screw in that it cuts a small amount of nylon while allowing the full diameter of the threads to form. The new P-K Type L offers a particular advantage in nylon assemblies which must be disassembled for service because the Type L can be readily removed and replaced without stripping or galling.

USING THREAD-CUTTING SEMS?

SEMS

Specify P-K, and get thread-cutting screws with a higher drive-strip ratio, *plus* the added holding power of a pre-assembled washer!

P-K Sems are readily available with a wide variety of washers pre-assembled to thread-cutting screw types "F" and "B-F". They may be ordered with slotted, Phillips or Hex heads. They can be hopper fed for automatic driving. Inspection rejects due to omitted lock washers are impossible. Fastenings stay tight and firm.

P-K Sems reach your assembly line pre-assembled, ready for instant use. They assure concentric washer seating—washers cannot come off. Double inventory and parts handling is completely eliminated.

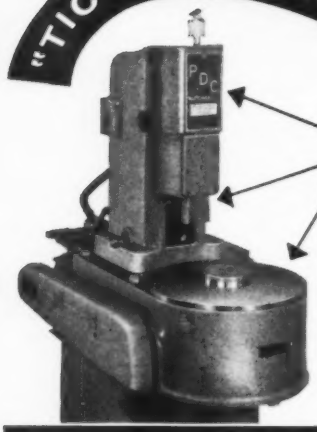
P-K Sems are also available with a wide variety of washers pre-assembled to thread-forming and machine screws.

Use the Function Factor formula and prove to yourself that Parker-Kalon thread-cutting screw types F and B-F consistently perform at a higher drive-strip ratio. Their use will increase production efficiency and reduce the "in-place cost" of fasteners in assembly operations. Production run samples may be obtained from your P-K Distributor, or write direct to the Parker-Kalon Sales Engineering Department.

PARKER-KALON *fasteners*

PARKER-KALON, a division of General American Transportation Corporation, Clifton, New Jersey. Offices and warehouses in Chicago and Los Angeles.

"TIC-TOCK AROUND THE CLOCK"...



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Standard risers available to increase shut height
PDC-EMUC-15 Electric Drive Index Table

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"AUTOMATIC"
DIAL ASSEMBLY PRESS
... Range to 6 Tons

A PROVEN FACT: the PDC Automatic Dial Assembly Press *increases* production and *lowers* costs, and has proven itself in production for many years. It can be either hand-fed or hopper-fed.

This Standard Dial Assembly Press is for operations such as

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This machine can also be furnished with spinner heads, rivet hammers, punch presses and many other types.

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Many uses —
—core pins, punches, gages, ejector pins, insert pins, special tools, etc. — Quick delivery.

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FIRST CLASS SWISS MADE
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HEIMANN TRANSFER SCREW SETS

IN 11 SIZES No. 6 to 1" N.C. In all S. A. E. sizes.

Here is the *faster*, more precise way of transferring open and blind screw holes—make savings in "wage-dollars-per hour" of your expensive hands on every job. A die-and-tool maker's tool with many other applications for die makers and machinists. A set of 6 Hardened Screws nested in combination holder and wrench —no other tools needed. Get more work *now*—save money too!

HEIMANN MFG. CO. • URBANA, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1425

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Number after colon refers to page number.

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SPECIAL RH & LH HIGH SPEED

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WHEN REQUESTING QUOTATIONS ALWAYS MENTION QUANTITIES

SIZE	THREADS PER INCH
0000	160
000	120
00	90-96-112
0	56-64-72-76-80-90
1	48-56-60-64-80-90
2	48-52-54-56-60-72-80-96
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Many more sizes in stock up to 6" dia.

LEFT HAND N.C. (USS)—N.F. (SAE) SIZES

SEE ABOVE SECTION FOR MORE SIZES

SIZE	THREADS	SIZE	THREADS	SIZE	THREADS	SIZE	THREADS
0	80	8	32-36	7/16	14-20	1"	8-12-14
1	64-72	10	24-32	1/2	13-20	1-1/8	7-12
2	56-64	12	24-28	9/16	12-18	1-1/4	7-12
3	48-56	14	20-24	5/8	11-18	1-5/16	6-12
4	36-40-48	1/4	20-28	11/16	11-16	1-3/8	6-12
5	40-44	5/16	18-24	3/4	10-16	1-7/16	6-12
6	32-40	3/8	16-24	7/8	9-14	1-1/2	6-12

'OVERSIZE' and 'UNDERSIZE' TAPS

RIGHT AND LEFT HAND N.C. AND N.F. SIZES

MACHINE SCREW	#2 to #5	Plus or Minus	.002, .003, .005
MACHINE SCREW	#6 to #14	Plus or Minus	.003, .005, .010
FRACTIONAL	1/4" to 1-1/2"	Plus or Minus	.003, .005, .010, .015, 1/64, 1/32

Right & Left Hand—Unlisted 'Gun' or Spiral Pointed Taps

Size	Threads	Size	Threads
0	80 NF		
1	56 NS	7/8	9 NC, 14 NF
2	56 NC, 64 NF	1	8 NC, 12-14 NF
9/16	12 NC, 18 NF	1-1/8	7 NC, 12 NF
5/8	11 NC, 18 NF	1-1/4	7 NC, 12 NF
11/16	11 NC, 16 NS	1-3/8	6 NC, 12 NF
3/4	10 NC, 16 NF	1-1/2	6 NC, 12 NF

Right Hand—Unlisted 'Pulley' And Extra Length Taps

Size	Threads	Size	Threads
4	36-40 NC, 48 NF	3/8	24-NF
5	40 NC, 44 NF	7/16	20 NF
6	32 NC, 40 NF	1/2	20 NF
8	32 NC, 36 NF	9/16	12 NC
10	24 NC, 32 NF	5/8	18 NF
12	24 NC, 28 NF	9/16	18 NF
1/4	28 NF	3/4	16 NF
5/16	24-NF	Also Larger Sizes	NC & NF

UNLISTED Right Hand "Pipe" Taps

"NPT" Taper	"NPT" Thread	"NPS" Size	"NPS" Thread	EX. LENGTHS "NPT" & "NPS" Size	EX. LENGTHS "NPT" & "NPS" Thread
1/16	27	1/16	27		
		1	8		
1/4	27	1-1/4	11½	1/16	27
2-1/2	8	1-1/2	11½	1/8	27
		2	11½	1/4	18
3	8	2-1/2	8	3/8	18
		3	8	1/2	14
3-1/2	8	3-1/2	8	3/4	14
4	8	4	8	1	11½
Also British		Also British		Also British	

Left Hand 'Pipe Taps' Taper and Straight

Size	Thread	Size	Thread
1/16	27	1	11½
1/8	27	1-1/4	11½
1/4	18	1-1/2	11½
3/8	18	2	11½
1/2	14	2-1/2	8
3/4	14	3	8
Also British		3-1/2	8
		Also British	

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- ☑ QUALITY
- ☑ PRICE

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(a) Kind of material being machined. (b) Depth of hole in inches, through or bottom. (c) Tap to be used horizontally or vertically. (d) Will tap turn, or is piece expected to be turned. (e) Is tapping job expected to be done in one pass. (f) Would tap be backed out of hole, or machine stopped for release of tap. (g) If possible, submit thread length, and overall length of tap desired with blue print.

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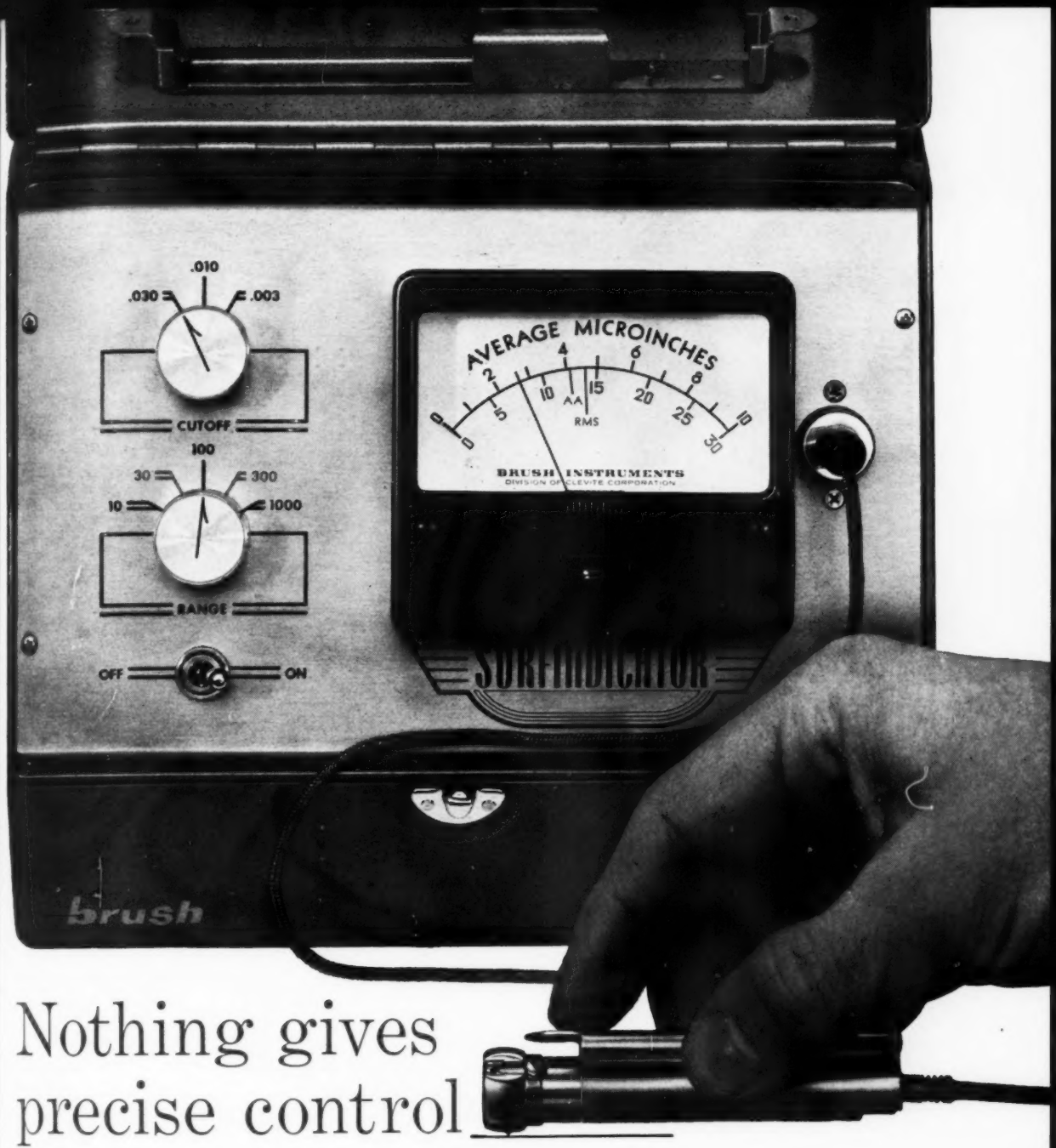

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